visual engineering
LIGHTWARE

UMX4x4-Pro

User's Manual

SAFETY INSTRUCTIONS

Class I apparatus construction. This equipment must be used with a main power system with a protective earth connection. The third (earth) pin is a safety feature, do not bypass or disable it.

This equipment should be operated only from the power source indicated on the product.

To disconnect the equipment safely from power, remove the power cord from the rear of the equipment, or from the power source. The MAINS plug is used as the disconnect device, the disconnect device shall remain readily operable.

There are no user-serviceable parts inside of the unit. Removal of the top cover will expose dangerous voltages. To avoid personal injury, do not remove the top cover. Do not operate the unit without the cover installed.

The apparatus shall not be exposed to dripping or splashing and that no objects filled with liquids, such as vases, shall be placed on the apparatus.

The apparatus must be safely connected to multimedia systems. Follow instructions described in this manual.

Replacing the AC fuse

Unplug the AC power cord from the equipment

Locate the AC fuse on the rear of the unit

Replace only the AC fuse as indicated on the rear panel of the unit: 3.15A fast blowing

Connect the power cord to the switcher and to the AC power source. Make sure the switcher is working properly.

WEEE (Waste Electrical & Electronic Equipment)

Correct Disposal of This Product

This marking shown on the product or its literature, indicates that it should not be disposed with other household wastes at the end of its working life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources.

Household users should contact either the retailer where they purchased this product, or their local government office, for details of where and how they can take this item for environmentally safe recycling.

Business users should contact their supplier and check the terms and conditions of the purchase contract. This product should not be mixed with other commercial wastes for disposal.

DECLARATION OF CONFORMITY

We,

Lightware Kft. 15 Peterdy Street, Budapest H-1071, HUNGARY

as manufacturer declare, that the products

UMX4x4-Pro
(Computer Matrix Switcher)

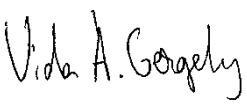
in accordance with the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EEC is in conformity with the following standards:

EMI/EMC ..... EN 55103-1 E3, EN 55103-2

Safety.....EN 60065 Class I

Date: 12 April 2012

Name: Gergely Vida (Managing Director)

Signed: 

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1. Introduction

Dear Customer,

Thank you for choosing Lightware UMX4x4-Pro matrix switcher. The UMX4x4-Pro router is able to switch 4 inputs to 4 outputs in a non-blocking crosspoint configuration.

The UMX4x4-Pro, the all-round Universal Matrix Switcher, is the perfect solution for ever-changing environments such as small board rooms and classrooms. UMX (Universal MatriX) technology was recently developed by Lightware to support various analog and digital audio visual formats. VGA, YUV, digital DVI, HDMI with HDCP, stereo analog and S/PDIF digital audio signals are all supported.

2. General description

2.1. Box contents

- UMX4x4-Pro routing switcher
- User's manual (this document)
- IEC power cable
- CD-ROM with control software
- RS-232 9 pole D-sub Male to Female straight serial cable
- UTP crosslink cable
- DVI to VGA adapter

2.2. Features

- **Advanced EDID Management –** The user can emulate any EDID on the switcher's inputs independently, read out and store any attached monitor's EDID in 100 internal memory locations, upload and download EDID files using Matrix Control Software.
- **Non-blocking cross point matrix architecture –** The router allows any input to be switched to any output or more outputs simultaneously.
- **2.25 Gb/s channel transmission –** Routes any DVI single link or HDMI signal between 25 and 225 MHz pixel clock frequency conforming to DVI 1.0 and HDMI1.3 standards.
- **Supports all HDTV resolutions –** 720p, 1080i, 1080p 2K etc. HDTV signals up to 225 MHz pixel clock frequency regardless of the actual resolution passed through the router.
- **Control by front panel buttons –** 4 source select, 4 destination select, Video layer, Audio layer, Take, Load preset, Save preset, EDID function, Signal present, Control Lock, Output Lock.
- **Reconfigurable buttons –** Each button has a removable flat cap and a translucent label that can be inserted under the cap to identify sources and destinations.
- **RS-232 control –** Simple ASCII based RS-232 protocol is used for switching, preset calling, status request, etc.
- **Ethernet control –** TCP/IP Ethernet 10Base-T or 100Base-TX (Auto- Sensing).

- **Built-in WEB site –** Easy access from a WEB browser to control and configure the switcher.
- **Universal power supply –** UMX4x4-Pro accepts AC voltages from 100 to 240 Volts with 50 or 60 Hz line frequency on standard IEC connector.
- **Power failure memory –** In case of power failure, the unit stores its latest configuration, and after next power up it loads automatically.
- **HDCP compliant –** UMX4x4-Pro complies with HDCP1.2 standard. Lightware is a legal HDCP adopter. The included Advanced HDCP Management eliminates the need for reauthentication upon switching.
- **20 meter input cable compensation –** Using 22AWG high quality DVI or HDMI cable, the inputs are automatically compensated for up to 20 meter cable length at 24bpp, which extends installation possibilities even at the highest HDTV or computer resolutions.
- **Pixel Accurate Reclocking –** (removes jitter caused by long cables) Each output has a clean, jitter free signal, eliminating signal instability and distortion caused by long cables or connector reflections.
- **Signal analysis –** Using the built-in webpage or Matrix Controller software the user can monitor incoming signal parameters such as resolution, signal timing parameters, color space, audio type, scan rate, HDCP encryption and so on.
- **Deep Color support and conversion –** It is possible to transmit the highest quality 36-bit video streams for perfect color reproduction. The signal can be converted freely on each output so you can get the best possible quality on every display.
- **DVI/HDMI conversion –** The router is able to convert from HDMI to DVI signals so that you can watch HDMI videos on your computer display without audio.
- **Fiber cable support –** Self powered DVI fiber cables using +5V from DVI sources (VGA cards, etc.) usually consume more than 50 mA, which load is maximum allowed by DVI 1.0 standard. UMX4x4-Pro supports +5V 500 mA constant current output on each DVI output to power long distance fiber optical cables.
- **Zero frame delay – Even on Analog Inputs -** Lightware's UMX4x4-Pro add no frame noticeable delay to the switched signal. There is no frame or line period delays to the signals when passing a Lightware router.
- **Separate Audio and Video matrix switching –** Video and audio signals can be separated and switched independently. Even if the HDMI stream contains embedded audio.
- **Analog Audio and Video A/D conversion –** UMX4x4-Pro converts uncompressed analog audio and video signal to digital and places it to the output.

2.3. Typical applications

Some typical connection variations with the matrix router are shown on Figure 2-1.

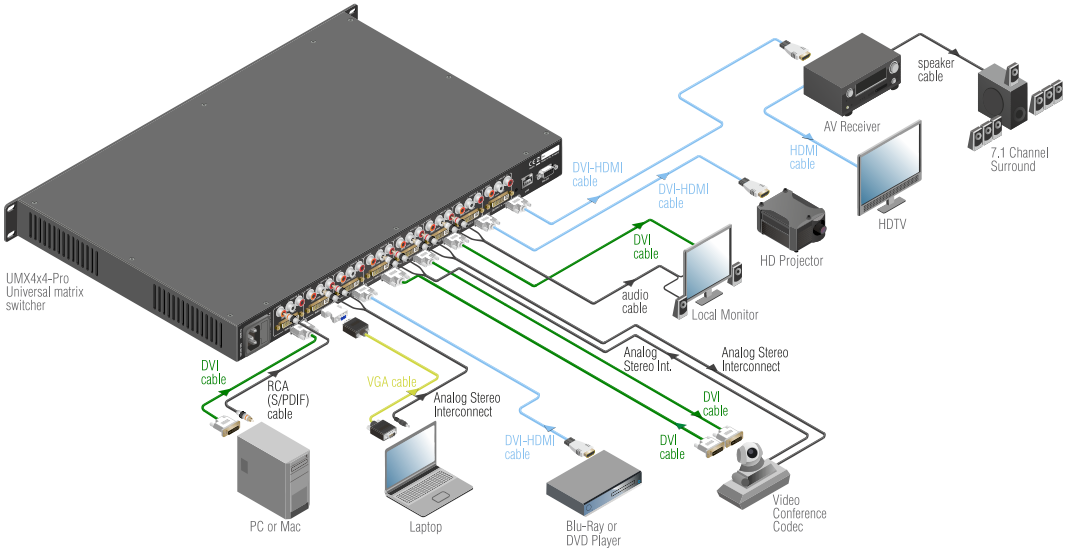


Figure 2-1. Typical application for UMX4x4-Pro

Application examples

- Small classrooms
- Conference rooms, collaborative telepresence
- Control room
- Multiroom video
- Home cinema

2.4. Understanding EDID

2.4.1. Basics

EDID stands for Extended Display Identification Data. Simply put, EDID is the passport of display devices (monitors, TV sets, projectors). It contains information about the display's capabilities, such as supported resolutions, refresh rates (these are called Detailed Timings), the type and manufacturer of the display device, etc.

After connecting a DVI source to a DVI display, the source reads out the EDID to determine the resolution and refresh rate of the image to be transmitted.

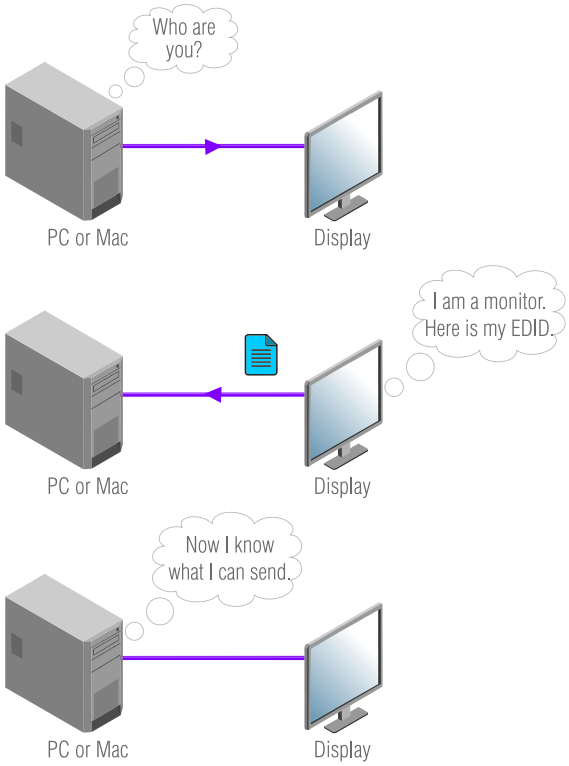


Figure 2-2. EDID communication

Most DVI computer displays have 128-byte long EDID structure. However, Digital Televisions and HDMI capable displays may have another 128 bytes, which is called E-EDID and defined by CEA (Consumer Electronics Association). This extension contains information about additional Detailed Timings, audio capabilities, speaker allocation and HDMI capabilities. It is important to know, that all HDMI capable devices must have CEA extension, but not all devices are HDMI capable which have the extension.

2.4.2. Common problems related to EDID

Problem: „My system consists of the following: a computer, a Lightware UMX4x4-Pro matrix, a WUXGA (1920x1200) LCD monitor, and an SXGA (1280x1024) projector. I would like to see the same image on the monitors and the projector. What EDID should I chose on the monitor and the projector?"

Solution: If you want to see the image on both displays, you need to select the resolution of the smallest display (in this case SXGA), otherwise the smaller display may not show the higher resolution image.

Problem: „I have changed to a different EDID on an input port of the matrix to have a different resolution but nothing happens."

Solution: Some graphics cards and video sources read out the EDID only after power-up and later they don't sense that EDID has been changed. You need to restart your source to make it read out the EDID again.

Problem: „I have a UMX4x4-Pro and I'm using a Lightware factory preset EDID. I would like to be able to choose from different resolutions, but my source allows only one resolution."

Solution: Most Lightware factory preset EDIDs allow only one resolution, forcing the sources to output only that particular signal. You need to select a Universal EDID. It supports all common VESA resolutions. Additionally it also features audio support.

2.5. Advanced EDID Management

Each DVI sink (e.g. monitors, projectors, plasma displays, and switcher inputs) must support the EDID data structure. Source BIOS and operating systems are likely to query the sink using DDC2B protocol to determine what pixel formats and interface are supported. HDMI standard makes use of EDID data structure for the identification of the monitor type and capabilities. Most DVI sources (VGA cards, set top boxes, etc.) will output DVI signal after accepting the connected sink's EDID information. In case of EDID readout failure or missing EDID the source will not output DVI video signal. UMX4x4-Pro provides Lightware's Advanced EDID Management function that helps system integration. The built in EDID Router stores and emulates 150 EDID data plus all monitor's EDID that are connected to the output connectors. First 100 EDID are factory presets, while memories 100 to 150 are user programmable. The router stores the EDID of all attached monitors or projectors for each output in a non-volatile memory. This way the EDID from a monitor is available when the monitor is unplugged, or switched off.

Any EDID can be emulated on any input. An emulated EDID can be copied from the EDID router's memory (static EDID emulation), or from the last attached monitors memory (dynamic EDID emulation). For example, the router can be set up to emulate a device, which is connected to one of the outputs. In this case the EDID automatically changes, if the monitor is replaced with another display device (as long as it has a valid EDID).

EDID is independently programmable for all inputs without affecting each other. All inputs have their own EDID circuit. EDID Router can be controlled via serial port or Ethernet.

Info *The user is not required to disconnect the DVI cable to change an EDID as opposed to other manufacturer's products. EDID can be changed even if a source is connected to the input and it is powered ON.*

Info *When EDID has been changed, the router toggles the HOTPLUG signal for 2 seconds. Some sources do not observe this signal, so in this case the change is not recognized by the source. In such cases the source device must be restarted or powered OFF and ON again.*

2.6. HDCP management

Lightware Visual Engineering is a legal HDCP adopter, and has developed several functions that helps to solve HDCP related problems.

2.6.1. Mixing encrypted and unencrypted signals

Complex AV systems often have both HDCP and non-HDCP components. Lightware hybrid modular routers allow to use HDCP encrypted and unencrypted signals in the same system.

HDCP and non-HDCP I/O boards can be used in the same matrix frame. The router will be still HDCP compliant as it will never output an encrypted signal to a non-HDCP compliant display device. If an encrypted signal should be switched to a non-compliant output, it will show a red screen alert or will be muted.

2.6.2. HDPC key caching

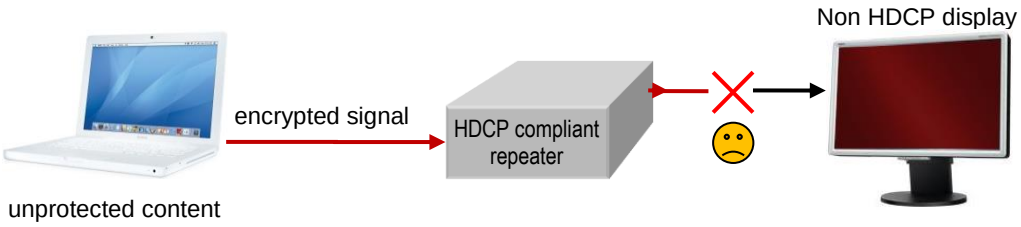
Lightware introduced the HDCP key cashing technique in early 2009 that validates all the display keys in an AV system during system boot up and keeps them constantly available for sources. This method eliminates the HDCP handshake at every switch and keeps all sources sending uninterrupted signals.

Without this function the sources should re-authenticate HDCP after each crosspoint switch which makes the displays to drop the signal and go black for 5-8 seconds. The HDCP key cashing technique avoids this and allows instantaneous switching between two encrypted signals.

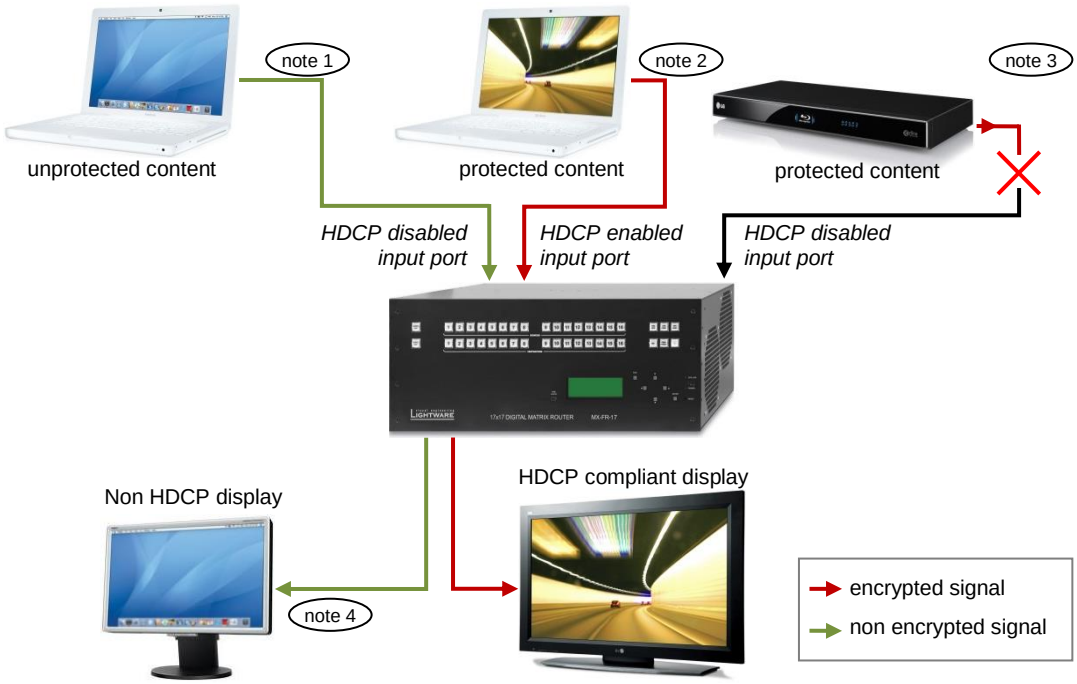
2.6.3. Avoiding unnecessary HDCP encryption

Many video sources send HDCP protected signal if they detect that the sink is HDCP capable – even if the content is not copyrighted. This can cause trouble if a HDCP capable device (e.g. repeater or matrix router) is connected between the source and the display. In this case the content can't be viewed on non-HDCP capable displays and interfaces like event controllers.

Rental and staging technicians often complain about Apple laptops, who always send HDCP encrypted signals if the receiver device (display, matrix router, etc.) reports HDCP compliancy. However HDCP encryption is not required all the time (e.g. computer desktop image) MacBook and MacBookPro still do that.



To avoid unnecessary HDCP encryption, Lightware introduced the HDCP enabling/disabling function: the HDCP capability can be disabled on each input port separately. If HDCP is disabled on an input port, the connected source will detect that the sink is not HDCP capable, and turn off authentication. The source will not be able to communicate with any of the devices (displays, repeaters, etc.) that are connected to the routers output, therefore it could not see if they are HDCP capable or not.



Note 1: *If a source detects that the input port is HDCP disabled, it will send only unprotected content.*

Note 2: *If a source detects that the input port is HDCP enabled, it could send protected or unprotected contents as well.*

Note 3: *HDCP protected content will not be sent to any input port with disabled HDCP setting.*

Note 4: *HDCP protected content will never be sent to a non HDCP compliant display.*

Please note that if HDCP capability is disabled on an input port, the connected source cannot send protected content to any display. If HDCP function is enabled on an input port and the source sends encrypted signal, the non-HDCP compliant devices cannot display the video. This new feature does not remove the encryption of an encrypted signal, and does not void HDCP standard at all.

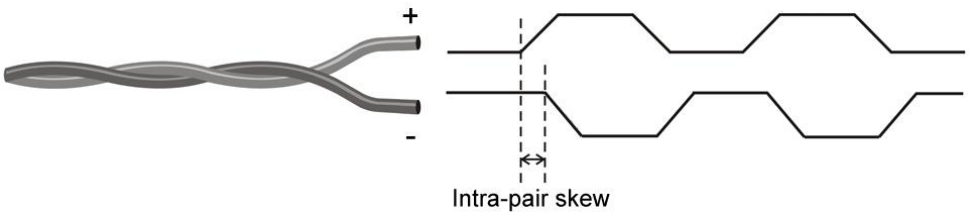
2.7. Pixel Accurate Reclocking

Signal reclocking is an essential important procedure in digital signal transmission. After passing the reclocking circuit, the signal becomes stable and jitter-free, and can be transmitted over more equipment like processors, or event controllers. Without reclocking, sparkles, noise and jaggies can be seen on the image.

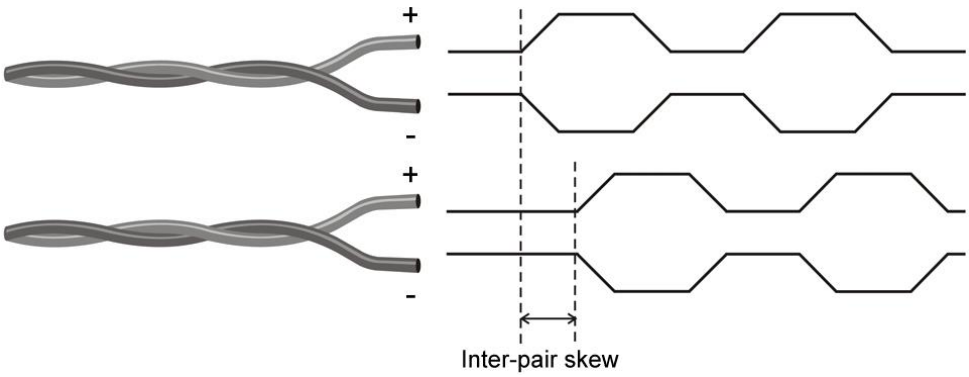
Lightware's sophisticated Pixel Accurate Reclocking technology fixes more problems than general TMDS reclocking. It removes not only intra-pair skew but inter-pair skew as well.

The Pixel Accurate Reclocking circuit eliminates the following errors:

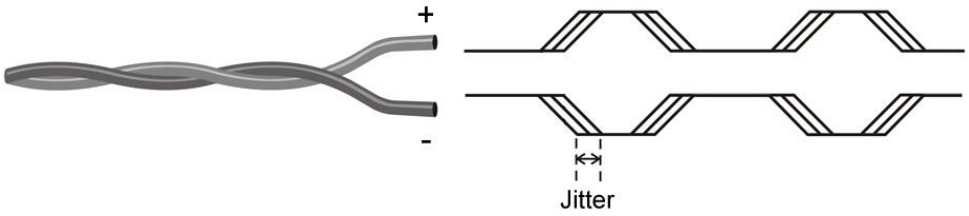
Intra-pair skew: skew between the + and - wires within a differential wire pair (e.g. Data2- and Data2+). It's caused by different wire lengths or slightly different wire construction (impedance mismatch) in HDMI cable. It results in jitter.



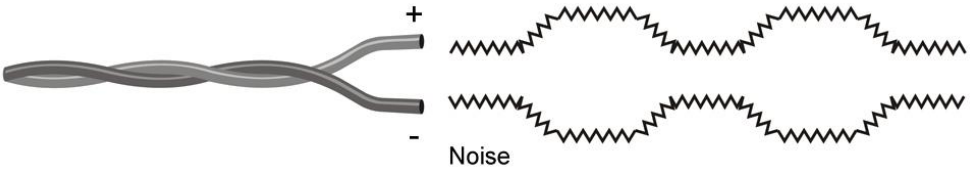
Inter-pair skew: skew between two differential wire pairs in a cable. It's caused by different wire pair lengths or different number of twists in the HDMI cable. Too much inter-pair skew results in color shift in the picture or sync loss.



Jitter: signal instability in the time domain. The time difference between two signal transitions should be a fix value, but noise and other effects cause variations.



Noise: electromagnetic interference between other electronic devices such as mobile phones, motors, etc. and the HDMI cable are coupled onto the signal. Too much noise results in increased jitter.



The Pixel Accurate Reclocking circuit completely regenerates the original video signal and outputs a strong, high-quality digital signal that conforms to the HDMI specification.

3. Controls and connections

3.1. UMX4x4-Pro front view

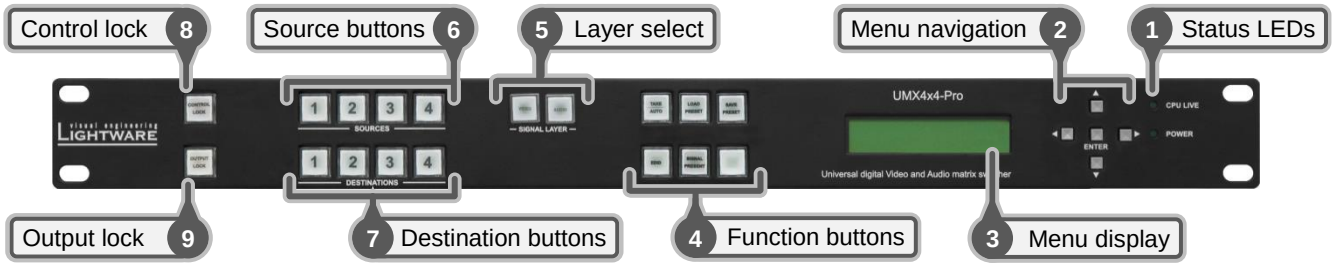


Figure 3-1. UMX4x4-Pro front view

1	**Status LEDs**	POWER LED indicating that the unit is powered on and CPU LIVE blinking LED indicating normal operation.
2	**Menu navigation**	(UP, DOWN, LEFT, RIGHT, ENTER) buttons for menu navigation.
3	**Menu display**	2x16-character LCD display with backlight for menu operations and settings.
4	**Function buttons**	Switching between working modes (Normal / EDID / Signal present, Take / Autotake) and Preset operations are available with the Function buttons.
5	**Layer select**	Audio and video signals are on different layer so they can be switched at the same time or separately. Layer select buttons chose the desired signal(s) what will be switched.
6	**Source buttons**	Source buttons have three functions: to select an input, to select a preset number, and to view the selected input's state (take mode).
7	**Destination buttons**	Destination buttons have two functions: to select an output, or to view the selected output's state.
8	**Control lock**	Disables or enables front panel operation. When it illuminates red, operations on front panel are prohibited.
9	**Output lock**	Locks and protects one (or more) outputs. It inhibits accidental input changing on protected outputs.

3.2. UMX4x4-Pro rear view

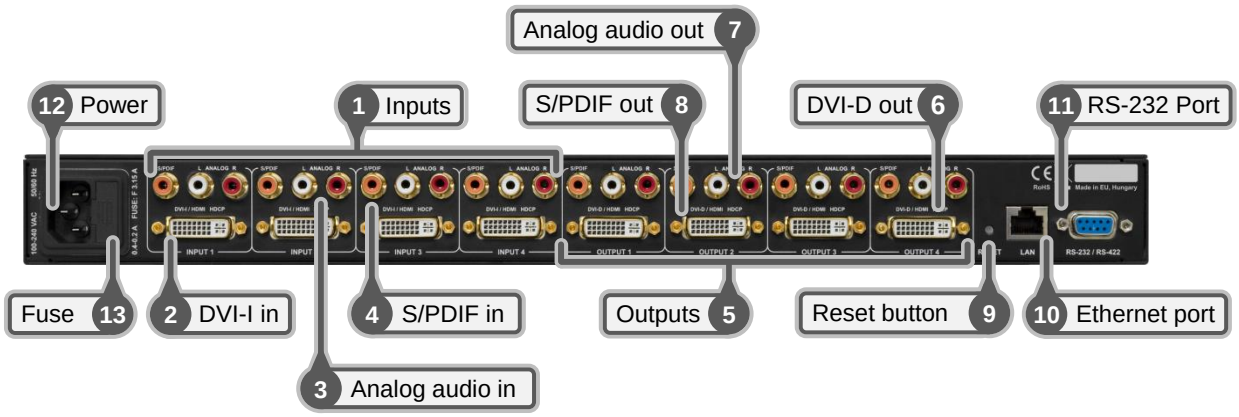


Figure 3-2. UMX4x4-Pro rear view

1	**Inputs**	UMX4x4-Pro has 4 input ports. Each port has one video, one analog stereo audio and one digital audio input.
2	**DVI-I in**	Standard 29-pole DVI-I connectors for input connections. It accepts analog and digital signals.
3	**Analog audio in**	Double RCA jack connector for analog stereo audio input signal with right and left channel.
4	**S/PDIF in**	RCA jack connector with S/PDIF digital audio signal.
5	**Outputs**	UMX4x4-Pro has 4 output ports. Each port has one video, one analog stereo audio and one digital audio output.
6	**DVI-D out**	Standard 29-pole DVI connectors for outputs - only digital pins are connected.
7	**Analog audio out**	Double RCA jack connector for analog stereo audio output signal with right and left channel.
8	**S/PDIF out**	RCA jack connector with S/PDIF digital audio signal. Embedded audio is still present on the DVI-D outputs.
9	**Reset button**	Hardware reset button. It resets the whole router, however saved settings, presets and EDIDs will be preserved.
10	**Ethernet port**	Standard RJ45 connector. This port can be connected to Local Area Network.
11	**RS-232 port**	9-pole D-sub female connector for standard RS-232 port.
12	**Power**	Standard IEC power connector. The router works with 100 to 240 Volts, 50 or 60 Hz power sources.
13	**Fuse**	Replace with F 3.15A type only.

3.3. Electrical connections

3.3.1. DVI inputs

UMX4x4-Pro provides standard 29 pole DVI-I connectors for inputs. This way, users can plug in any DVI connector, but keep in mind that analog signals (such as VGA or RGBHV) are processed only on the DVI inputs.

Always use high quality DVI cable for connecting sources and displays.

Pin	Signal	Pin	Signal	Pin	Signal
1	TMDS Data2-	**9**	TMDS Data1-	**17**	TMDS Data0-
2	TMDS Data2+	**10**	TMDS Data1+	**18**	TMDS Data0+
3	TMDS Data2 Shield	**11**	TMDS Data1 Shield	**19**	TMDS Data0 Shield
4	*nc*	**12**	*Nc*	**20**	*nc*
5	*nc*	**13**	*Nc*	**21**	*nc*
6	DDC Clock	**14**	+5V Power	**22**	TMDS Clock Shield
7	DDC Data	**15**	GND (for +5V)	**23**	TMDS Clock+
8	*Analog Vertical Sync*[1]	**16**	Hot Plug Detect	**24**	TMDS Clock-
C1	*Analog Red* [1]	**C2**	*Analog Green* [1]	**C3**	*Analog Blue* [1]
C4	*Analog Horizontal Sync* [1]	**C5**	GND		

Table 3-1. DVI-I connector pin assignments

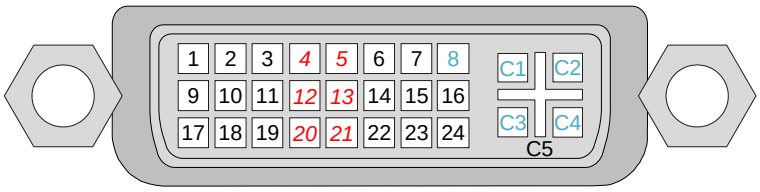


Figure 3-3. DVI connector

[1] - These pins are connected only on the DVI inputs.

3.3.2. DVI outputs

29 pole DVI-I connectors for outputs have only digital pins internally connected. This way, users can plug in any DVI connector, but keep in mind that analog signals (such as VGA or RGBHV) are NOT available on the outputs.

Fiber Cable powering

DVI outputs are able to supply 500 mA current on DDC +5V output (pin 14 on output connectors) which is sufficient to supply power to fiber optical DVI cables. Standard DVI outputs usually supply only 55 mA current on +5V output, thus unable to directly power a fiber optical cable.

Info *The matrix switcher does not check if the connected sink (monitor, projector or other equipment) supports Hotplug or EDID signals but outputs the selected signal immediately after switch command.*

3.3.3. RS-232 control port

UMX4x4-Pro can be remote controlled through industry standard 9 pole D-SUB female connector. The router can be ordered with RS 232 control port.

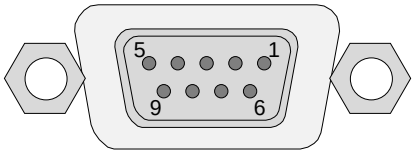


Figure 3-4. D-SUB 9 pole female connector (DE9F)

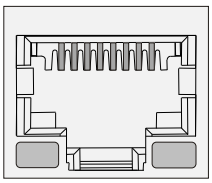
Pin nr.	RS-232
1	NC - non connected
2	**TX data transmit (output)**
3	**RX data receive (input)**
4	DTR (Internally connected to Pin 6)
5	**GND signal ground (shield)**
6	DSR (Internally connected to Pin 4)
7	RTS (Internally connected to Pin 8)
8	CTS (Internally connected to Pin 7)
9	NC - non connected

Table 3-2. D-sub connector pin assignment for standard RS-232

3.3.4. Ethernet port

Lightware UMX4x4-Pro matrices can be remote controlled through Ethernet as well. The Ethernet port can be connected to a LAN hub, switch or router with a UTP patch cable. If connecting to a computer directly, a cross UTP cable has to be used!

See section 4.5 about remote operation on page 41 for more information.



	LED1	LED2
OFF	no activity	no link
Amber	half duplex	10 Mbps
Green	full duplex	100 Mbps
Blink	activity	N/A

Figure 3-5. RJ45 receptacle connector

Figure 3-6. RJ45 plug

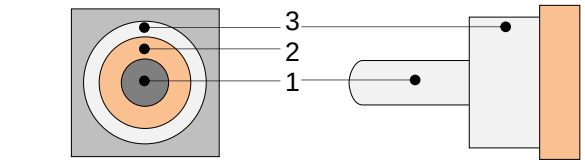
Lightware recommends the termination of TP cables on the basis of TIA/EIA T 568 A or TIA/EIA T 568 B standards.

Pin	Name	TIA/EIA T568 A	color and name	TIA/EIA T568 B	color and name
1	TX +		white/green stripe		white/orange stripe
2	TX -		green solid		orange solid
3	RX +		white/orange stripe		white/green stripe
4	Not used		blue solid		blue solid
5	Not used		white/blue stripe		white/blue stripe
6	RX -		orange solid		green solid
7	Not used		white/brown stripe		white/brown stripe
8	Not used		brown solid		brown solid

Table 3-3. Recommended termination of TP cables

3.3.5. Digital audio input and output connectors

UMX4x4-Pro has standard RCA receptacles for digital coaxial audio inputs and outputs.



RCA receptacle RCA plug

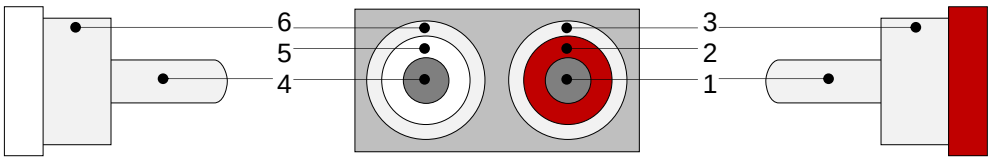
Nr.	Name
1	S/PDIF input or output
2	Plastic insulator
3	GND

Table 3-4. RCA connector pin assignments for digital audio

Info *Plugs and sockets on consumer equipment are conventionally color-coded by CEA/CEDIA-863-B (ANSI) to aid correct connections. According to the standard Lightware uses orange colored RCA connectors for S/PDIF signals.*

3.3.6. Analog stereo audio input and output connectors

UMX4x4-Pro has standard RCA receptacle for analog stereo audio inputs and outputs. Inputs and outputs work with standard line-in and line-out voltage levels.



RCA plug (left channel) RCA receptacles RCA plug (right channel)

Nr.	Name
1	Right channel input or output
2	Plastic insulator
3	GND
4	Left channel input or output
5	Plastic insulator
6	GND

Table 3-5. RCA connector pin assignments for analog audio

Info *Plugs and sockets on consumer equipment are conventionally color-coded by CEA/CEDIA-863-B (ANSI) to aid correct connections. According to the standard Lightware uses red colored RCA connectors for right channel of analog stereo audio signals and white colored RCA connectors for left channel of analog stereo audio signals.*

4. Operation

4.1. Power

Connect the power cord to the router's IEC C14 standard power input connector. The router is immediately powered ON when the power cord is connected to the AC source.

During the initial self-test and loading of the latest settings ,,Booting…" appears on the LCD screen. After the self-test, the router reloads its last configuration and it is ready to use. In case of hardware failure, an error message is displayed.

Info: *After switching ON, the router reloads the latest settings that were used before it was turned off. The router has an internal emergency memory that stores all current settings and tie configurations. This memory is independent from presets and invisible for the user. This built-in feature helps the system to be ready immediately in case of power failure or accidental power down.*

4.2. Front panel operations

4.2.1. Signal layers

Video and audio signals are in different layers. It means video and audio signals can be switched separately or together. For example the video signal of the first input and the audio signal of the second input can be switched to the first output.

At least one layer is selected all the time. Therefore the currently selected layer buttons are illuminated. To toggle between the layers' on and off state press the VIDEO and/or the AUDIO signal layer buttons. If a layer was selected the button is light continuously. If only one layer was selected and the associated button is pressed the layer will be deselected and the other layer will be selected.

Before every operation which effects input and output signals (e.g. switching, muting, locking, etc.) the desired layer should be selected.

4.2.2. TAKE / AUTOTAKE modes

The router has two different switching modes: TAKE and AUTOTAKE. If the TAKE / AUTO button is unlit, TAKE mode is active. When the TAKE / AUTO button continuously lights green, AUTOTAKE mode is selected.

Press and hold the TAKE / AUTO button for three seconds to toggle between TAKE and AUTOTAKE modes.

TAKE mode allows the user to connect or disconnect multiple outputs to an input at once. This mode is useful when time delay is not allowed between multiple switching. The commands are only realized when the TAKE button is pressed. If no button is pressed for two seconds, all preselected actions (which were not realized with the pressing TAKE) will be ignored, and the router returns to its idle state.

AUTOTAKE mode is useful when immediate actions must be done or fast switching is needed between sources on a particular destination. In this mode switching occurs immediately upon pressing one of the input selector buttons.

4.2.3. CONTROL LOCK

Front panel button operations can be enabled or disabled using CONTROL LOCK button, while RS-232 and Ethernet control is still enabled. If the button is not illuminated, front panel button operations are enabled. If it illuminates red continuously, front panel operations are inhibited (including LCD menu).

Press and hold the CONTROL LOCK button for 3 seconds to toggle the control lock state.

4.2.4. SOURCES and DESTINATIONS buttons

Input and output ports have dedicated buttons on the front panel. These buttons are labeled with numbers and have backlight to indicate active or selected ports. These are referred as SOURCES and DESTINATIONS buttons.

4.2.5. Viewing crosspoint state

User can check the current switching status on the front panel using front panel buttons. This status view feature is slightly different in TAKE or AUTOTAKE modes because of different switching philosophy of the two modes.

Important! *Each layer has own crosspoint state. If only one layer is selected the current state belongs to the active layer. If both of the layers are selected the showed crosspoint state belongs to the VIDEO layer.*

Info *Status view occurs whenever the router has to be switched. After entering the view state, the user can change the routing configuration. Viewing and switching can be done after each other, or if nothing is pressed for three seconds, the router returns to idle state.*

View current state in TAKE mode

If all source and destination buttons and TAKE button are unlit (the unit is in TAKE mode, and no input was selected in last 3 seconds), user can verify both input and output connections for any layer. This informative display will remain for 3 seconds, and then all button lamps go out. In TAKE mode no accidental change can be done unless TAKE button is pressed.

For viewing **input connections**, select the desired layer(s) then press and release a source button. Now the selected source button and all destination buttons will light up which are currently connected to the selected source.

For viewing **output connections**, select the desired layer(s) then press and release a destination button. Now the source button which is connected to the selected destination will light up. If no source button is lighting, the selected destination is in muted state.

View current state in AUTOTAKE mode

In AUTOTAKE mode only states of destinations can be viewed.

Select the desired layer. Press and release the required destination button. Now the source button which is connected to the selected destination will light up. If no source button is lighting, the selected destination is muted or disconnected. By pressing another destination button, the state of that destination can be seen.

Info: *Muting or disconnecting an output cannot be done in AUTOTAKE mode.*

Info: *Be careful, as in AUTOTAKE mode if a source button is pressed, it is immediately connected to the last selected destination.*

4.2.6. Switching

Creating connections in TAKE mode

Step 1. Select the desired layer. (Video or audio or both of them)

Step 2. Press and release the desired source button. The pressed source button and all destination buttons which are currently connected to this source will light up. The dark remaining destination buttons are not connected to this source. This is an informative display about current status of the selected input (view only).

Step 3. Press and release the desired destination button or buttons which has to be connected to the selected source. The preselected destination button(s) start(s) blinking.

Step 4. Press and release TAKE button to execute switching. Now the selected input is switched to the selected output or to the multiple outputs.

Info: A source button can be pressed twice to preselect all outputs. Outputs which are connected to the pressed input light up and all other outputs start to blink. Some outputs can be unselected if needed, then pressing TAKE executes the switching.

Info: If the pressed destination is locked then it could not be selected. This is indicated by a short flash of the OUTPUT LOCK when a locked destination is pressed.

Disconnecting or muting in TAKE mode

Step 1. Select the desired layer. (Video or audio or both of them)

Step 2. Press and release the selected source button. The pressed source button and all destination buttons which are currently connected to this source will light up. The dark remaining destination buttons are not connected to this source. This is an informative display about current status of the selected input (view only).

Step 3. Press and release the selected, green lighting destination button which has to be disconnected from the selected source. The pressed destination or multiple destinations will turn dark.

Step 4. Press and release TAKE button to execute disconnection.

Info Deselected destinations are disconnected from any source, thus output devices will display black image or "no signal" message, or automatically will turn off.

Info: If the pressed destination is locked then it could not be deselected. This is indicated by a short flash of the OUTPUT LOCK when a locked destination is pressed.

Info: Multiple switching and deselecting actions can be done simultaneously, during only one TAKE action.

Creating a connection in AUTOTAKE mode

Step 1. Select the desired layer. (Video or audio or both of them)

Step 2. Press and release the desired destination button. The pressed destination button and the actually connected source button light up green. If no source is connected (the output is muted) no source button will light up.

Step 3. Press and release the desired input button. The switch action will be executed immediately. Switching between sources to the selected destination can be done directly.

Info: If the pressed destination is locked then sources could not be selected. This is indicated by a continuously light of the OUTPUT LOCK when a locked destination is pressed.

4.2.7. Switching operations flowchart

To better understand the viewing and switching sequence in TAKE and AUTOTAKE modes, please study the below diagrams.

Switching sequences are the same with any layer selection.

Info *Layers can be selected or deselected whenever during the switching sequence.*

TAKE mode

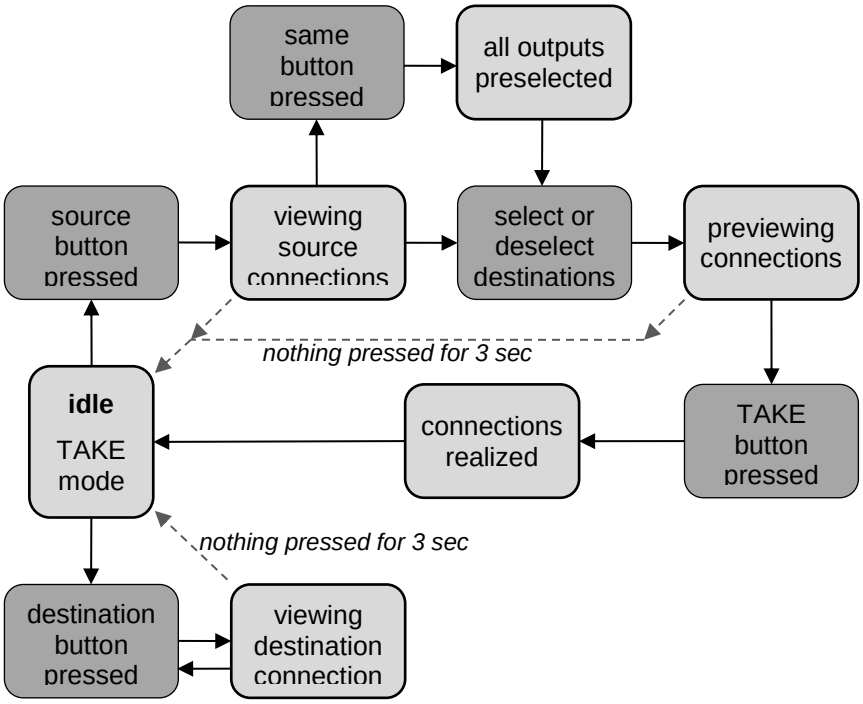


Figure 4-1. Switching flowchart in TAKE mode

AUTOTAKE mode

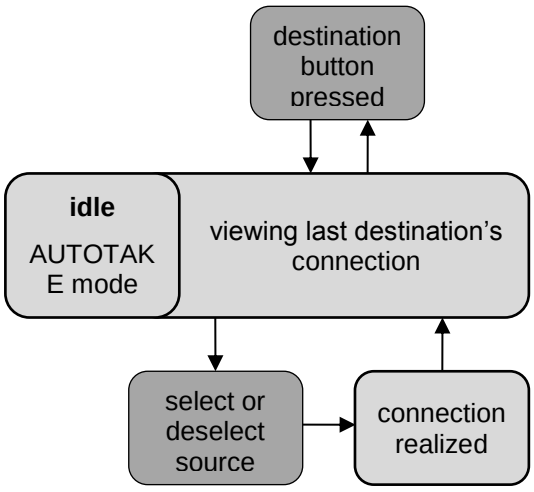


Figure 4-2. Switching flowchart in AUTOTAKE mode

4.2.8. Preset operations

All Lightware matrices have 32 user programmable presets. Each preset stores a configuration regarding all input connections and mute state for all outputs and both of the layers. All presets are stored in a non-volatile memory; the router keeps presets even in case of power down. Memory numbers are assigned to source buttons 1 to 4. The higher numbered presets are accessible only through software control.

Saving a Preset in TAKE mode

Step 1. Select the desired layer. (Video or audio or both of them)

Step 2. Create the desired connections which have to be saved.

Step 3. Press and release the SAVE PRESET button.

Step 4. Press and release a source button according to the desired memory address (source 1 to 4).

Step 5. Press and release TAKE button. Now the current configuration is stored in the selected memory.

Info *Preset save action always stores the current configuration for all outputs including mute state, but ignoring lock state.*

Loading a Preset in TAKE mode

Step 1. Press and release LOAD PRESET button.

Step 2. Press and release a source button according to the desired memory address (source 1 to 4).

Step 3. Press and release TAKE button. Now the selected preset is loaded.

Info *Loading a preset modifies all output states that are not currently locked.*

Saving a Preset in AUTOTAKE mode

Step 1. Select the desired layer. (Video or audio or both of them)

Step 2. Create the desired connections which have to be saved.

Step 3. Press and release SAVE PRESET button.

Step 4. Press and release a source button according to the desired memory address (source 1 to 4). Now the current configuration is stored in the selected memory.

Info *Preset save action always stores the current configuration for all outputs including mute state, but ignoring lock state.*

Loading a Preset in AUTOTAKE mode

Step 1. Press and release LOAD PRESET button.

Step 2. Press and release a source button according to the desired memory address (source 1 to 4). Now the selected preset is loaded.

Info *Loading a preset modifies all output states that are not currently locked.*

4.2.9. OUTPUT LOCK

Using Lightware routers it is possible to lock a destination's state. This feature prevents an accidental switching to the locked destination in case of important signal. Locking a destination means, that no input change or muting can be executed on that particular destination.

Destinations can be independently locked or unlocked. Locking a destination does not affect other destinations. Layers can be independently locked or unlocked as well. Locking a layer does not affect the other layer.

View locked outputs in TAKE mode

Step 1. Select the desired layer. (Video or audio or both of them)

Step 2. Press and release the Output Lock button.

Step 3. The Output Lock button starts to blink and all the buttons of any locked destinations light up, and remain illuminated for three seconds.

Lock an output in TAKE mode

Step 1. Select the desired layer. (Video or audio or both of them)

Step 2. Press and release the Output Lock button.

Step 3. Now the Output Lock button starts to blink and all the locked output's buttons illuminate green (view state).

Step 4. If no button is pressed for three seconds, the router returns to idle state.

Step 5. If an unlit output button is pressed, it starts to blink, to indicate that it is preselected for output locking.

Step 6. Press and release TAKE button. The selected destinations are now locked.

Unlock an output in TAKE mode

Step 1. Select the desired layer. (Video or audio or both of them)

Step 2. Press and release the Output Lock button.

Step 3. Now the Output Lock button starts to blink and all the locked output's buttons illuminate green (view state).

Step 4. If no button is pressed for three seconds, the router returns to idle state.

Step 5. If an illuminating output button is pressed, it goes off, to indicate that it is preselected for unlocking.

Step 6. Press and release the TAKE button. The deselected destinations are now unlocked.

View locked outputs in AUTOTAKE mode

In AUTOTAKE mode a destination is selected all the time. Therefore the currently selected output and input buttons are illuminated. The Output Lock button illuminates regarding to the lock state of the current output.

Viewing all locked outputs is not possible in AUTOTAKE mode, as pressing the Output Lock button instantly locks or unlocks the current output.

Lock an output in AUTOTAKE mode

Step 1. Select the desired layer. (Video or audio or both of them)

Step 2. Press and release the required destination button. Now the selected destination button and the currently configured source button light up (view mode).

Step 3. Press and release the Output Lock button. Now the Output Lock button lights up in red, and lock function is activated at once. No source can be changed at the locked destination.

Unlock an output in AUTOTAKE mode

Step 1. Press and release the required destination button which was previously locked. Now the selected destination button and the currently configured source button and the Output Lock button light up.

Step 2. Press and release the Output Lock button (deselect). Now the Output Lock button turns off, and the locking function has been cancelled.

4.3. About EDID memory

EDID memory is non-volatile and consists of four blocks, each for different purpose. These blocks are:

- Factory preset EDIDs
- User saved EDIDs
- Dynamic EDIDs (EDID of last connected sink on a specific output port)
- Emulated EDIDs (EDID currently emulated on a specific input port).

EDIDs are numbered from 1 in each block, and they can be referred as the first letter of the block name, and the number of the desired EDID. This way F02 refers to the second factory preset EDID, and D04 refers to the display device's EDID on output 4.

The memory structure is as follows:

F01..F99 ..... Factory Preset EDIDs

U01..U50 ..... User programmable memories

D01..D04..... Last attached monitor's EDIDs (outputs)

E01..E04 ..... Emulated EDIDs (inputs)

All EDIDs (including factory preset; user programmable memories; EDID at other inputs; and EDID at outputs) can be switched and emulated at any of the inputs.

Info: *The factory EDIDs (Fxx) are factory preprogrammed and cannot be modified. These are the most commonly used resolutions.*

Info: *UMX4x4-Pro can handle both 128 Byte EDID and 256 Byte extended EDID structures.*

Info: *The attached monitor's EDID is stored automatically, until a new monitor is attached to that particular output. In case of powering the unit off, the last attached monitor's EDID remains in non-volatile memory even is the monitor is unconnected.*

4.3.1. EDID types

Most of the factory preset EDIDs include only one resolution. This is to force the connected source to give a signal with the needed resolution. However there are Universal EDIDs as well which allow many resolutions.

The factory EDIDs are divided into groups regarding their type. Some EDIDs are supporting DVI only, some support HDMI, and some are for analog VGA signals.

Analog EDIDs can be used for input ports which have a VGA (RGBHV) source.

DVI EDIDs does not support audio. The Universal DVI EDID indicates support for many PC resolutions.

HDMI EDIDs support embedded audio. These EDIDs indicate that any audio format is accepted (PCM, Dolby, DTS, etc.). There are three Universal HDMI EDIDs which include the same resolutions but support different capabilities.

EDID	PCM audio	other audio	deep color
Universal_HDMI_PCM	yes	no	no
Universal_HDMI_ALL	yes	yes	no
Universal_HDMI_DC	yes	yes	yes

4.3.2. Factory EDID list

Memory	Resolution	Type
F01	640 x 480 @ 60.0 Hz	DVI
F02	848 x 480 @ 60.0 Hz	DVI
F03	800 x 600 @ 60.30 Hz	DVI
F04	1024 x 768 @ 60.0 Hz	DVI
F05	1280 x 768 @ 50.0 Hz	DVI
F06	1280 x 768 @ 59.92 Hz	DVI
F07	1280 x 768 @ 75.0 Hz	DVI
F08	1360 x 768 @ 60.1 Hz	DVI
F09	1280 x1024 @ 50.0 Hz	DVI
F10	1280 x1024 @ 60.1 Hz	DVI
F11	1280 x1024 @ 75.1 Hz	DVI
F12	1400 x 1050 @ 49.99 Hz	DVI
F13	1400 x1050 @ 59.99 Hz	DVI
F14	1400 x1050 @ 75.0 Hz	DVI
F15	1680 x1050 @ 59.99 Hz	DVI
F16	1920 x1080 @ 50.0 Hz	DVI
F17	1920 x1080 @ 60.0 Hz	DVI
F18	2048 x1080 @ 50.0 Hz	DVI
F19	2048 x1080 @ 59.99 Hz	DVI
F20	1600 x1200 @ 50.0 Hz	DVI
F21	1600 x1200 @ 60.0 Hz	DVI
F22	1920 x1200 @ 50.0 Hz	DVI
F23	1920 x1200 @ 59.55 Hz	DVI
F24	2048 x1200 @ 59.95 Hz	DVI
F25	*Reserved*	DVI
F26	*Reserved*	DVI
F27	*Reserved*	DVI
F28	*Reserved*	DVI
F29	**Universal_DVI**	DVI
F30	1440 x 240 @ 60.3 Hz	HDMI
F31	1440 x 288 @ 50.6 Hz	HDMI
F32	640 x 480 @ 59.94 Hz	HDMI
F33	720 x 480 @ 59.92 Hz	HDMI
F34	720 x 576 @ 50.0 Hz	HDMI
F35	1280 x 720 @ 50.0 Hz	HDMI
F36	1280 x 720 @ 60.0 Hz	HDMI
F37	1920 x 540 @ 50.3 Hz	HDMI
F38	1920 x 540 @ 50.0 Hz	HDMI
F39	1920 x 540 @ 59.98 Hz	HDMI
F40	1920 x 540 @ 60.5 Hz	HDMI
F41	1920 x1080 @ 24.0 Hz	HDMI
F42	1920 x1080 @ 24.99 Hz	HDMI
F43	1920 x1080 @ 30.0 Hz	HDMI
F44	1920 x1080 @ 50.0 Hz	HDMI
F45	1920 x1080 @ 59.93 Hz	HDMI
F46	1920 x1080 @ 60.0 Hz	HDMI
F47	**Universal_HDMI_PCM**	HDMI
F48	**Universal_HDMI_ALL**	HDMI
F49	**Universal_HDMI_DC**	HDMI

Memory	Resolution	Type
F50	720 x 480 @ 30.1 Hz	Analog
F51	720 x 576 @ 25.3 Hz	Analog
F52	640 x 480 @ 60.0 Hz	Analog
F53	640 x 480 @ 75.0 Hz	Analog
F54	800 x 600 @ 50.0 Hz	Analog
F55	800 x 600 @ 60.30 Hz	Analog
F56	800 x 600 @ 74.99 Hz	Analog
F57	1024 x 768 @ 49.98 Hz	Analog
F58	1024 x 768 @ 60.0 Hz	Analog
F59	1024 x 768 @ 75.2 Hz	Analog
F60	1280 x 768 @ 50.0 Hz	Analog
F61	1280 x 768 @ 59.92 Hz	Analog
F62	1280 x 768 @ 75.0 Hz	Analog
F63	1360 x 768 @ 60.1 Hz	Analog
F64	1364 x 768 @ 50.0 Hz	Analog
F65	1364 x 768 @ 59.93 Hz	Analog
F66	1364 x 768 @ 74.98 Hz	Analog
F67	1280 x1024 @ 50.0 Hz	Analog
F68	1280 x1024 @ 60.1 Hz	Analog
F69	1366 x1024 @ 59.99 Hz	Analog
F70	1400 x1050 @ 49.99 Hz	Analog
F71	1400 x1050 @ 59.99 Hz	Analog
F72	1400 x1050 @ 75.0 Hz	Analog
F73	1920 x 540 @ 50.0 Hz	Analog
F74	1920 x 540 @ 59.98 Hz	Analog
F75	1920 x1080 @ 50.0 Hz	Analog
F76	1920 x1080 @ 60.0 Hz	Analog
F77	1600 x1200 @ 50.0 Hz	Analog
F78	1600 x1200 @ 60.0 Hz	Analog
F79	1920 x1200 @ 59.55 Hz	Analog
F80	1920 x1200 @ 50.0 Hz	Analog
F81	*Reserved*	Analog
F82	*Reserved*	Analog
F83	*Reserved*	Analog
F84	*Reserved*	Analog
F85	*Reserved*	Analog
F86	*Reserved*	Analog
F87	*Reserved*	Analog
F88	*Reserved*	Analog
F89	**Universal_Analog**	Analog
F90	*Reserved*	
F91	*Reserved*	
F92	*Reserved*	
F93	*Reserved*	
F94	*Reserved*	
F95	*Reserved*	
F96	*Reserved*	
F97	*Reserved*	
F98	*Reserved*	
F99	*Reserved*	

Table 4-1. Factory preset EDID list

4.4. Front panel LCD menu operation

4.4.1. Basic concept

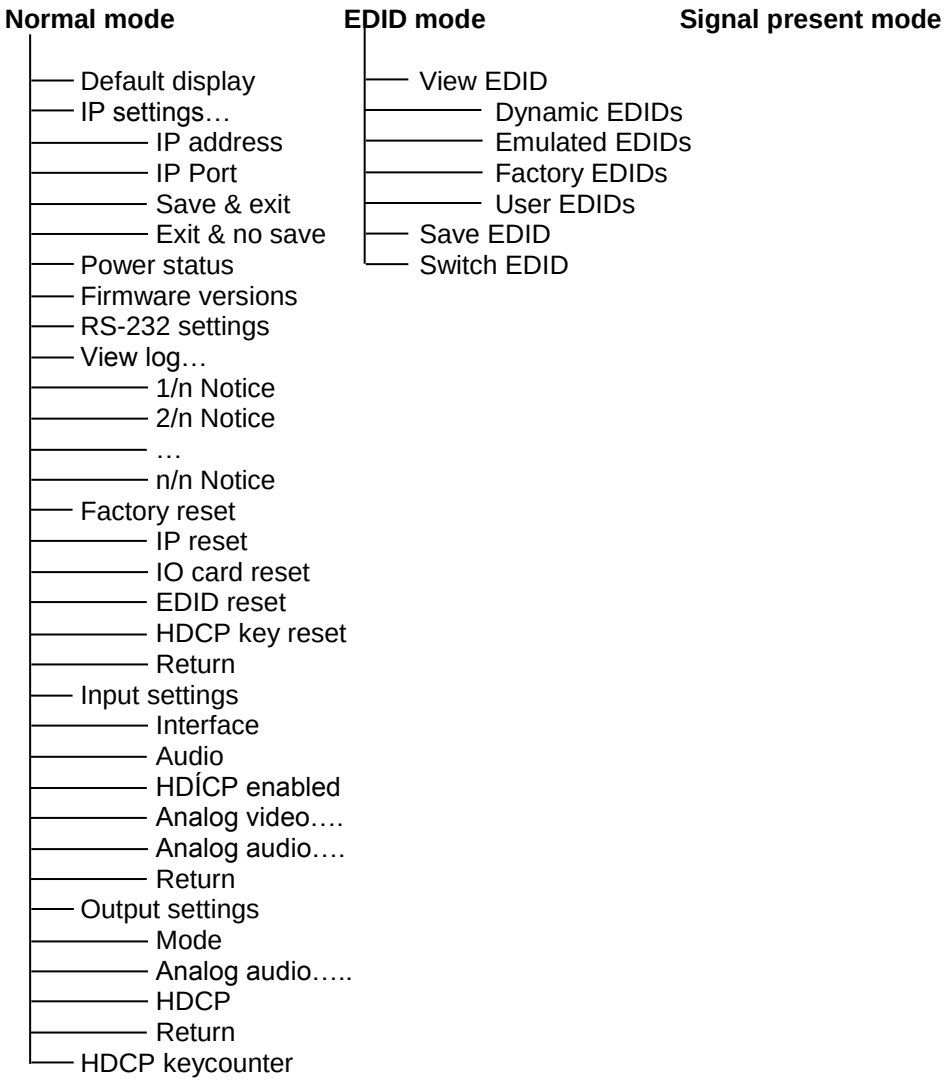
There are three operating modes of the LCD menu:

Normal mode Most settings can be done in this mode. It is active when neither the EDID nor the SIGNAL PRESENT button lights.

EDID mode Use this mode to set up the emulated EDID on the inputs, learn EDID form the outputs or to view the EDID memory. Enter or exit this mode by pressing the EDID button. The illuminated button shows that this mode is active.

Signal present mode This mode is for checking the presence of the display devices and incoming signals. Enter or exit this mode by pressing the SIGNAL PRESENT button. The illuminated button shows that this mode is active.

4.4.2. Menu structure



4.4.3. Navigation

The front panel LCD has 2 lines and 16 characters in each line. The left ◄ and right ► buttons can be used to scroll between menu items. The enter ◆ button steps in the submenus or makes changes available. The up ▲ and down ▼ navigation buttons modify the value for the current menu item.

4.4.4. Normal mode

Main menu list

Left ◄ and right ► buttons select between menu items. Enter ◆ button steps in submenus or select the changeable values.

Default display

Default display activates after power up. This screen shows the current IP address, the current IP port and the serial number of the matrix.

```
192.168.254.254
10001  11230101
```

IP settings menu

This menu contains IP address assignment settings and TCP / IP Port value. If the DHCP is switched off then IP Gateway and IP Subnet mask can be set as well. Changes take place only when 'Save & settings' is executed. Select the 'Exit & no save' to return to main menu without saving any changes.

```
IP settin9s...
```

IP address settings

Navigate to this item and press ENTER ◆ button to be able to change the value. Use the up ▲ and down ▼ buttons to toggle between DHCP and fix IP address. If the DHCP is switched off then the IP address can be set by the user. The four part of the fix IP address can be set separately. Use the left ◄ and right ► buttons to select the part, and then use the up ▲ and down ▼ buttons to change the value of that part. To take effect settings press ENTER ◆ button.

```
IP ADDR DHCP
```

```
IP ADDR fixIP
192.168.002.054
```

TCP / IP Port value

Navigate to this item with the up left ◄ and right ► buttons and press ENTER ◆ button to be able to change the value. Use the up ▲ and down ▼ buttons to change the TCP/IP port value. To take effect settings press ENTER ◆ button.

```
IP PORT   10001
MAC:00204AE32773
```

IP Gateway

If the DHCP is switched off then IP Gateway settings are available. This address can be set the same like IP address.

```
IP GATEWAY
000.000.000.000
```

IP Subnet

If the DHCP is switched off then IP Subnet settings are available. This address can be set the same like IP address.

```
IP SUBNET
000.000.000.000
```

Save settings

Any changes made in the IP settings menu come alive only when 'Save & exit' is executed. To do this, navigate to this item with the left ◄ and right ► buttons, then press ENTER ◆.

```
Save & exit
```

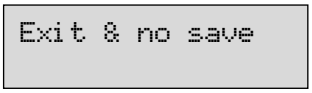
The 'Operation in progress' message appears on the LCD. If saving the settings succeed then 'Operation done!' message is shown for 3 seconds.

Important: *New IP settings can be applied while an active connection is alive on the Ethernet port but in this case the active connection will be closed automatically. To reconnect the Ethernet port needs to be used again.*

Info: *If you get ,,OPERATION FAILED" message then please disconnect the remote TCP/IP sockets and try again.*

Exit without save

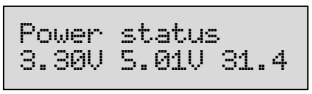
To discard changes execute 'Exit & no save'. To do this, navigate to this item with the left ◄ and right ► buttons, then press ENTER ◆.

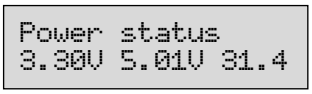


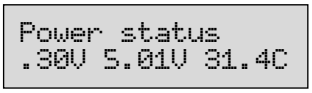
Power status

Navigate to this menu in the main menu list and press ENTER ◆. The monitored voltage levels (nominal 3.3V and nominal 5V) and the temperature of the main processor are shown on the LCD panel. String to be shown is longer than LCD display line. Wait a second and the string will be shifted to left character by character.

No changes can be made here. Press left ◄ and right ► buttons to select another menu item.

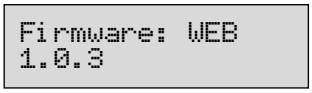






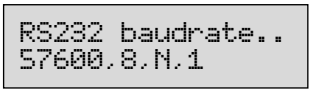
Firmware versions

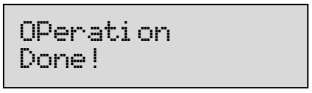
Navigate to this menu in the main menu list and press the up ▲ and down ▼ buttons to view the desired firmware version number. Press left ◄ and right ► buttons to select another menu item.



RS-232 settings menu

The serial port baud rate value can be set here. Press the ENTER ◆ and use the up ▲ and down ▼ buttons to change the baud rate value. Changes take place when ENTER ◆ is pressed. A beep sound and the 'Operation done!' message indicate that the protocol is changed.



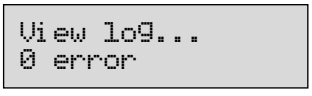


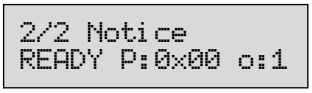
View log menu

Navigate to this menu in the main menu list and press ENTER ◆ Use the up ▲ and down ▼ buttons to toggle between the notices.

System events and errors can be checked in this menu. Use the up ▲ and down ▼ buttons to scroll between the log entries. The first line of each log entry shows the current entry number, number of all entries, and the level of the current entry. The second line is the name of the event that created the entry. The third line shows a hexadecimal parameter and an occurrence counter. The occurrence shows how many times the event happened since the last startup.

Press the ENTER ◆ button to return to main menu.

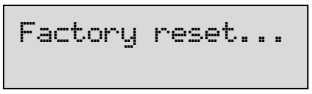




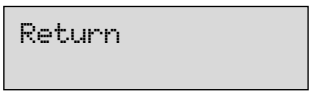
Level	Description
Notice	Not an error. Initialization information.
Warning	Possible problem without influencing normal operation.
Matter	Problem that may lead to further errors.
Error	Serious error. Must report to support.
Fatal	Fatal error. Normal operation is not possible.

Info: *This log can contain NOTICEs and WARNINGs under normal operation. These entries do not mean that there is any problem with the matrix!*

Factory reset

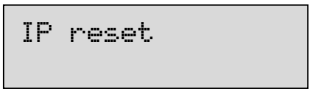


This menu contains submenus which can reload factory defaults for certain group of settings separately. Press the ENTER ◆ button to enter to the submenus. After selecting an option (submenu) with the left ◄ and right ► buttons, press ENTER ◆ to execute it. Any reset operation has to be confirmed with ENTER ◆. 'Operation is progress!' message appears during the executing, and 'Operation done!' message and a beep sound indicate the successful execute. The 'IO card reset' operation needs to reboot the matrix.



Select the 'Return' to step back to the main menu.

IP reset submenu



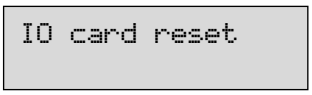
This operation reloads the factory default IP settings.

Parameter	Default value
IP address (fix)	192.168.254.254
port number	10001
Subnet mask	255.255.0.0
Gateway	0.0.0.0

Press the ENTER ◆ button to execute IP reset. Confirmation message will be appeared. String to be shown is longer than LCD display line. Wait a second and the string will be shifted to left character by character.

Press the ENTER ◆ button again to confirm the operation or press the up ▲ or down ▼ buttons to cancel the operation.

IO card reset submenu



This operation reloads the factory default settings for all input and output ports. The matrix will reboot after execution.

Press the ENTER ◆ button to execute IP reset. A confirmation message will be appeared. The string to be shown is longer than LCD display line. Wait a second and the string will be shifted to left character by character.

Press the ENTER ◆ button again to confirm the operation or press the up ▲ or down ▼ buttons to cancel the operation.

EDID reset submenu

This operation emulates the factory default F49 EDID (Universal HDMI with deep color) to all input ports.

Press the ENTER ◆ button to execute IP reset. Confirmation message will be appeared. The string to be shown is longer than LCD display line. Wait a second and the string will be shifted to left character by character.

Press the ENTER ◆ button again to confirm the operation or press the up ▲ or down ▼ buttons to cancel the operation.

HDCP key reset submenu

This operation clears the HDCP key cache in the matrix. This is useful when a source cannot accept as many keys as the matrix stores.

```
HDCP key reset
```

Press the ENTER ◆ button to execute IP reset. Confirmation message will be appeared. The string to be shown is longer than LCD display line. Wait a second and the string will be shifted to left character by character. Press the ENTER ◆ button again to confirm the operation or press the up ▲ or down ▼ buttons to cancel the operation.

```
HDCP key reset?
Press ENTER to P
```

Input settings

Navigate to this menu in the main menu list.

Select the input port

Use the up ▲ and down ▼ buttons to select the port that needs adjustment and then press the ENTER ◆ button.

```
InPut settin9s
InPut  #
```

Input port settings submenu

Use the left ◄ and right ► buttons to select the parameter to be changed. Use the up ▲ and down ▼ buttons to change the value.

1) The 'Interface' parameter sets the video signal type which is connected to the input port. It can be set to Auto, Digital, Analog YUV, Analog RGB or Analog auto. Use the up ▲ and down ▼ buttons to change the value.

```
InPut #
Interface:Auto
```

   The Auto source setting accepts both digital and analog signals on the input and selects the one which is first detected.

Info *If the source signal type is unknown the recomended interface setting is the Auto.*

2) Three different audio sources can be connected to one input port at the same time. The 'Audio' parameter selects which incoming audio signal will be placed to the selected output port. Use the left ◄ and right ► buttons to select the parameter to be changed. Use the up ▲ and down ▼ buttons to change the value.

```
InPut #
Audio:Analo9
```

   The audio source settings can be:

   Mute, HDMI, Analog, SPDIF

   Auto (HDMI, Analog), Auto (SPDIF, Analog)

   Auto (HDMI, SPDIF, Analog), Auto (SPDIF, HDMI, Analog)

   If only one input is selected (**Analog** or **SPDIF** or **HDMI**); than only this type of audio can be placed on the output.

   If **Mute** is selected than the matrix ignores the audio input signals.

   Every **AUTO** value has a priority order. The matrix checks the first item of the priority list. If there is a valid audio signal on that audio input the signal will be placed to the outputs. If there isn't the matrix checks the second item of the priority list. And so on.

Info *If the second item of the priority list was selected (e.g. SPDIF) and the first item (e.g. HDMI embedded) appears on the input UMX4x4-Pro selects the first one (HDMI embedded) immediately.*

3) The HDCP capability on the input port can be enabled or disabled with the **HDCP enabled** setting. It can be set to Yes or No. This can prevent unnecessary HDCP encryption with certain source devices. Note that only unprotected contents can be played on the source if this setting is No. Use the up ▲ and down ▼ buttons to change the value. For more information about HDCP handling see section *2.6* and *2.6.3* on page *14*.

4) Navigate to the 'Analog video….' Submenu then press the ENTER ◆ button to change the analog video settings on the selected input port. Use the left ◄ and right ► buttons to select the parameter to be changed. Use the up ▲ and down ▼ buttons to change the value.

a. Phase
b. H.Pos
c. V.Pos
d. H.Size
e. V.Size
f. Clock
g. Return

Navigate to the 'Return' item then press the ENTER ◆ button to step back to the 'Analog video' menu.

Info *The 'Analog video' submenu available only if there is a valid analog audio signal on the current input port.*

Info *UMX4x4-Pro examines the analog video signal on the input port and adjusts the analog video settings automatically. The user can modify these values.*

5) Navigate to the 'Analog audio….' Submenu then press the ENTER ◆ button to change the analog audio settings on the selected input port. Use the left ◄ and right ► buttons to select the parameter to be changed. Use the up ▲ and down ▼ buttons to change the value.

Gain

Analog audio gain is the amplify of the built in preamplifier. It can be set up manually from 0 dB to 24 dB with 3 dB steps.

Phase

If there is a phase reverse item in the amplifier chain analog audio signal can be compensated by changing the polarity in the UMX4x4-Pro. It can be set up manually to 0 degree (Normal) or 180 degree (Inverted) manually.

DC filter

Remove DC component from the analog audio signal if it is enabled. It can be set up manually to Enabled or Disabled.

Navigate to the ‘Input 1 Return’ item then press the ENTER ◆ button to step back to the input port settings.

6) Navigate to the ‘Return’ item then press the ENTER ◆ button to step back to the main menu.

```
Return
```

Output settings

Navigate to this menu in the main menu list.

Select the output port

Use the up ▲ and down ▼ buttons to select the port that needs adjustment and then press the ENTER ◆ button.

```
OutPut settin9s
OutPut  #
```

Output port settings submenu

Use the left ◀ and right ▶ buttons to select the parameter to be changed. Use the up ▲ and down ▼ buttons to change the value.

1) Mode: The ‘Mode’ can be set to Auto, DVI, HDMI 24bit, HDMI 30bit or HDMI 36bit. The ‘Auto’ option sets the signal mode regarding to the attached display device’s EDID and the incoming signal. Use the up ▲ and down ▼ buttons to change the value.

```
OutPut #
Mode: Auto
```

2) Analog audio….: The ‘Analog audio….’ Submenu contains the attributes of the analog audio signal which is connected to the input port. Use the left ◀ and right ▶ buttons to select the parameter to be changed. Use the up ▲ and down ▼ buttons to change the value.

```
OutPut #
Analo9 audio....
```

   a. Volume: from 0 dB to -78 dB

```
OutPut #
Volume:-0dB
```

   b. Balance: from 0% to 100%

```
OutPut #
Balanve:50%
```

   c. Bass: from 0 dB to 24 dB with 2dB steps

```
OutPut #
Bass:0 dB
```

   d. Treble: from 0 dB to 6 dB with 2 dB steps

```
OutPut #
Treble:0 dB
```

   e. Deemphasis: Enabled or disabled

```
OutPut #
DeemPhasis:Disab
```

   f. Output phase: 0 or 180 degree

```
OutPut #
OutPut Phase:0
```

   g. Return

   Navigate to the ‘Output 1 Return’ item then press the ENTER ◆ button to step back to the output port settings

```
OutPut #
Return
```

3) The ‘HDCP’ option sets the HDCP encryption on the output. The Auto setting applies encryption when the incoming signal is encrypted. The Always setting forces encryption on any incoming video signal. Use the up ▲ and down ▼ buttons to change the value.

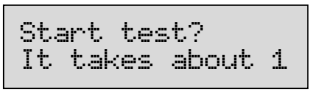
```
OutPut #
HDCP:Auto
```

4) Return: Navigate to the ‘Return’ item then press the ENTER ◆ button to step back to the out port settings.

```
OutPut #
Return
```

HDCP keycounter

This menu allows to test source devices how many HDCP keys they can accept. Select the input port with the up ▲ and down ▼ buttons, to which the tested device is connected to, and then press the ENTER ◆ button to execute keycounter test. Confirmation message appears: 'Start test? It takes about 1-2 minutes.' The string to be shown is longer than LCD display line. Wait a second and the string will be shifted to left character by character.



Press the ENTER ◆ button to start the operation.

A message appears showing the test progress. It can take several minutes to complete. Interrupt is not allowed during the HDCP keycount test. Wait with other operations until the test is finished.

After the test is finished, the result is shown. Press ENTER ◆ to acknowledge the result and return to previous menu.

4.4.5. EDID mode

To enter or to exit from this mode press and release the EDID button. EDID mode is active when the EDID button is illuminated on the front panel. All EDIDs are referred with their memory location e.g. F49 or D03, see section *4.3* about EDID memory structure on page *30*.

Select menu items with the left ◄ and right ► buttons and then press ENTER ◆ to step in submenus.

Info: *You can cancel any not yet executed operation by exiting the EDID menu with pressing the EDID button.*

Info: *Source and destination buttons are disabled while EDID mode is active.*

View EDID

If the EDID button is pressed the View EDID submenu opens automatically. All the stored EDIDs can be checked through this menu.

The most important information about each EDID is shown in the submenu. The string to be shown is longer than LCD display line. Wait a second and the string will be shifted to left character by character.

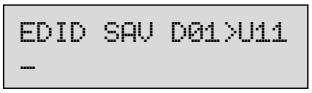
Use the up ▲ and down ▼ buttons to select the desired EDID. The monitor name and the preferred resolution can be checked.

Save EDID menu

The EDID from any connected monitor can be learned to user memory slots.

Select 'Save EDID..' menu items with the left ◄ and right ► buttons and then press ENTER ◆ to step in the submenu.

Select the dynamic EDID of the output port with the up ▲ and down ▼ buttons. Then press left ◄ or right ► buttons and select the user EDID slot where the monitor's EDID has to be stored.



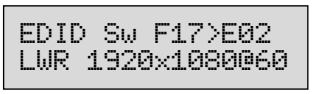
After the desired dynamic EDID and user memory is selected press the ENTER ◆ button to store the EDID.

The ‘Operation is progress’ message appears on the LCD. If switching the EDID succeed then the ‘Operation done!’ message is shown for 2 seconds.

Switch EDID menu

Select ‘Switch EDID..’ menu items with the left ◄ and right ► buttons and then press ENTER ◆ to step in the submenu.

The emulated EDIDs can be changed in this menu. Dynamic, User or Factory EDIDs can be selected in the top row with the up ▲ and down ▼ buttons. The preferred resolution of the selected EDID is shown in the second row of the screen.



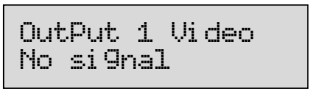
Press left ◄ or right ► button then select the input port with the up ▲ and down ▼ buttons.

After the desired EDID and input port is selected press the ENTER ◆ button to change the emulated EDID.

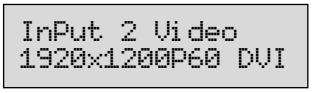
The ‘Operation is progress’ message appears on the LCD. If switching the EDID succeed then the ‘Operation done!’ message is shown for 2 seconds.

4.4.6. Signal Present mode

To enter or exit this mode you have to press the SIGNAL PRESENT button. Signal present mode is active when Signal present button is illuminated.



In this mode the source and destination buttons show the actual connection state of the corresponding port. Press any SOURCE or DESTINATION button, and detailed information of that port can be checked on the LCD menu. (Resolution, refresh rate, type of the video signal)



Source and destination buttons

If a source button is illuminated then a signal is present on that source. If a destination button is illuminated then a powered display is attached to this output (Hot Plug Detect signal is present). You can quickly check the cable connections with this feature.

4.5. Remote operation

Lightware matrix routers can be controlled through various interfaces remotely. This makes it possible to use functions that are not accessible via the front panel. Also, this helps system integrators and operators to control multiple devices in a big system through a single user interface.

4.5.1. Control interfaces

Users can connect to the matrix through

- Ethernet (TCP/IP),
- Serial port (RS-232)

After establishing connection, there is no difference between connection types (except some rare cases, which are uniquely noted).

The available remote connections and the relating chapters are listed below.

User interface	Connection type		further information
	Ethernet port	RS-232 serial port	
Lightware matrix controller software	✓	✓	chapter 0 on page 44
Built-in website	✓	no	chapter 6 on page 64
third party control system	✓	✓	chapter 7 on page 80

Table 4-2. Available remote connections

Info *Ethernet port can be connected to a LAN hub, switch or router with a UTP patch cable. If connecting to a computer directly, a crosslink UTP cable has to be used!*

User interface comparison

The built-in website and the Lightware matrix controller software have little different capabilities. The table below summarizes the main differences, helping you to select the interface that suits your needs.

Function	Matrix controller software	Built-in website
platform	Windows only	ANY ✓
installation	installation required	web browser needed only ✓
I/O and preset names	✓	✓
Preview presets	✓	no
Easy EDID creator	✓	no
EDID editor	✓	no
EDID upload / download	✓	no

Table 4-3. User interface comparison

4.5.2. Multiple simultaneous connections

The matrix allows simultaneous remote control over multiple interfaces. Ethernet and Serial connections can be used at the same time. However only 1 connection can be used on the Ethernet port at the same tme.

4.5.3. Serial port settings

UMX4x4-Pro uses RS-232 communication port. The device uses standard RS-232 interface with the following default settings:

9600 Baud, 8 data bit, 1 stop bit, no parity

The serial port baud rate can be changed on the front panel LCD menu or remotely by protocol command.

4.5.4. IP settings

The Ethernet port can be configured on the front panel LCD menu, remotely through the Controller software, or the built-in website.

The factory default IP settings or DHCP mode can be activated quickly through front panel shortcut buttons. To reset the IP configuration perform the following:

Resetting the IP address

Reset to factory default IP configuration or to DHCP mode with front panel buttons.

Step 1. Switch the router to TAKE mode if used previously in AUTOTAKE mode by pressing TAKE button for 3 seconds (light will go off).

Step 2. Press and hold down the Control Lock button for 3 seconds (Control Lock button lights in up red continuously).

Step 3. Press and keep pressed the Output Lock button (the current protocol indication will light up).

Step 4. Press and release the

a) **Load Preset** button to set the **factory default IP** settings

IP address:	192.168.254.254
port number:	10001
subnet mask:	255.255.0.0
gateway:	0.0.0.0

b) **Save Preset** button to set **DHCP enabled**

IP address:	Acquired with DHCP
port number:	unchanged
subnet mask:	Get from DHCP server
gateway:	Get from DHCP server

Step 5. A light sequence will occur to confirm the command. (Take/Auto, Load Preset and Save Preset buttons will light up one after the other)

Step 6. Wait about 5 seconds before connecting the router via Ethernet.

4.5.5. Control protocols

Matrix routers can be controlled with multiple control protocols. Lightware routers have a special protocol, but to interoperate with third party devices, a secondary protocol is also provided.

Info: *Lightware Matrix Controller software and the built-in website works only with LW protocol (#1)!*

The currently used protocol can be viewed or changed any time on the matrix front panel or with protocol commands.

Change (view) protocol on the front panel

Step 1. Switch the router to TAKE mode if used previously in AUTOTAKE mode by pressing TAKE button for 4 seconds. (light will go off)

Step 2. Press Control Lock button for 3 seconds (it lights in up red continuously)

Step 3. Press and keep pressed the Output Lock button. Now the active protocol is displayed: (view protocol) One source button lights up according to the current protocol:

- Source#1 lights: Lightware protocol active on Serial
- Source#2 lights: Protocol#2 is active on Serial

Step 4.

a) If you do not want to change the protocol, release the Output Lock button (view only).

b) If you want to change the protocol keep the Output Lock button pressed, and press the desired Source button.

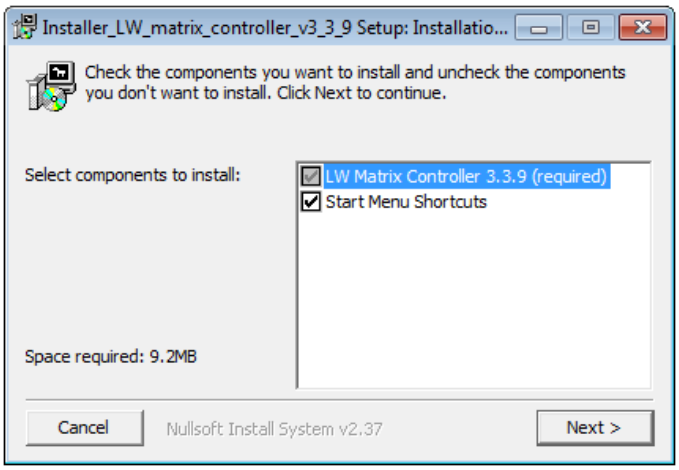
Step 5. If the control protocol for any interface has changed then a beep will sound to notify the change.

5. Software control – Using Lightware Matrix Controller

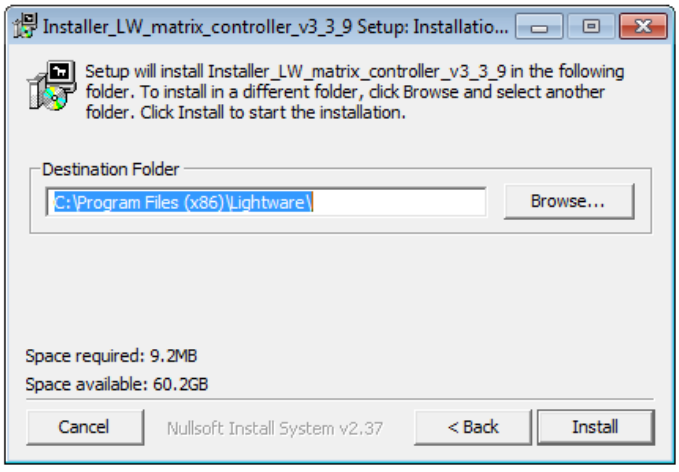
The matrix router unit can be controlled using Lightware Matrix Controller from a Windows PC or Laptop through RS-232 or Ethernet port.

5.1. Installing the Matrix Controller software

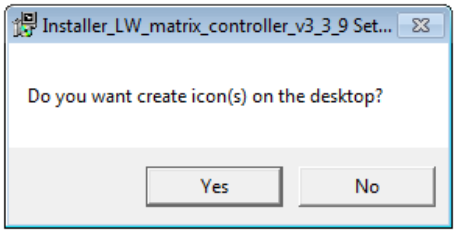
Step 1. Run Installer_LW_matrix_controller_v3_3_9.exe


Installer_LW_matrix_controller_v3_3_9 Setup: Installatio...
Check the components you want to install and uncheck the components you don't want to install. Click Next to continue.
Select components to install:
LW Matrix Controller 3.3.9 (required)
Start Menu Shortcuts
Space required: 9.2MB
Cancel
Nullsoft Install System v2.37
Next >

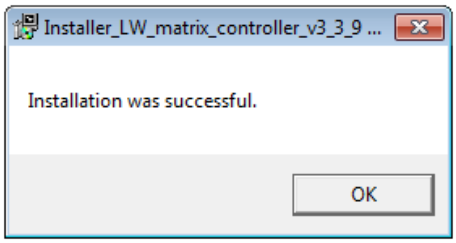
Step 2. Select destination folder and click Install (Using the default path is highly recommended)


Installer_LW_matrix_controller_v3_3_9 Setup: Installatio...
Setup will install Installer_LW_matrix_controller_v3_3_9 in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.
Destination Folder
C:\Program Files (x86)\Lightware\
Browse...
Space required: 9.2MB
Space available: 60.2GB
Cancel
Nullsoft Install System v2.37
< Back
Install

Step 3. If you want to create desktop icon click Yes in the next pop-up window:



Step 4. After finishing the installation the following message appears:



Step 5. To run Lightware matrix control software find the shortcut icon in Start menu → Programs → Lightware → LW_matrix_controller_v3.3.9 or on the desktop, and double click:

Uninstalling

To uninstall the control software double click on: Start menu → Programs → Lightware → LW_matrix_controller_v3_3_9 → Uninstall

5.2. Establishing the connection

The unit can be controlled from a Windows computer using Lightware Matrix Controller software through RS-232 connection or Ethernet port.

Step 1. Connect the matrix switcher and the computer either via

- Serial port, with RS-232 Male to Female cable (straight through)
- Ethernet, with LAN patch cable (to a Hub, Switch or Router)
- Ethernet, with LAN cross cable (directly to Computer)

Info *If the connection is made through the router's Ethernet port, be sure that the computer is in the same network as the router.*

Info *If the computer has multiple Ethernet connections (for example WiFi and LAN connections are used simultaneously) you will have to know the IP address for the one that is used for controlling the matrix.*

Step 2. Start the application

To run the CONTROL SOFTWARE double click on the icon of the software on the desktop or select proper shortcut from Start Menu → Programs → Lightware folder.

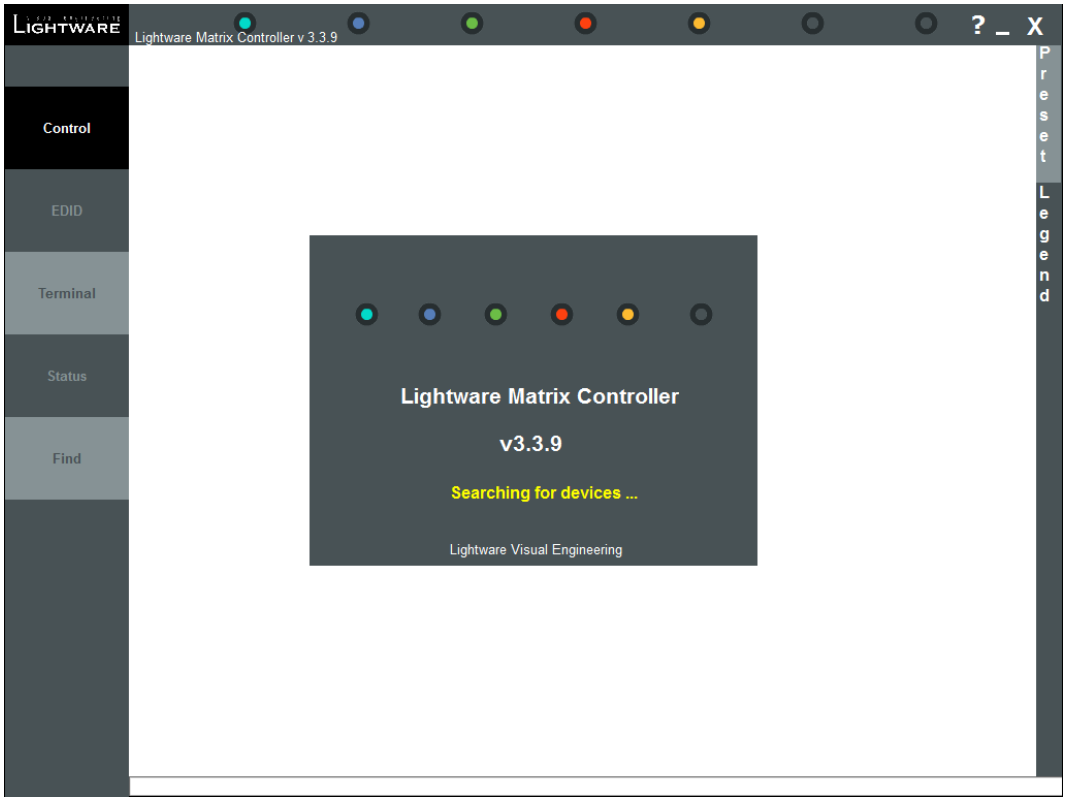


Figure 5-1. Matrix Controller software startup

Step 3. The Find dialog appears automatically

If the connection has been made via **Ethernet**, the software picks the primary Ethernet interface, and shows the available Lightware devices on that port. The device type and the serial number are displayed automatically. Click the desired device, to highlight it.

If the computer has more Ethernet ports (for example WiFi and LAN connections are used simultaneously), you must select the one that is used to control the router from the drop-down list. If you are unsure which one to use, try to search for devices on all of them.

If the connection has been made via **serial port**, the device type and serial number can be inquired by double clicking the appropriate port, or it can be highlighted with a single click.

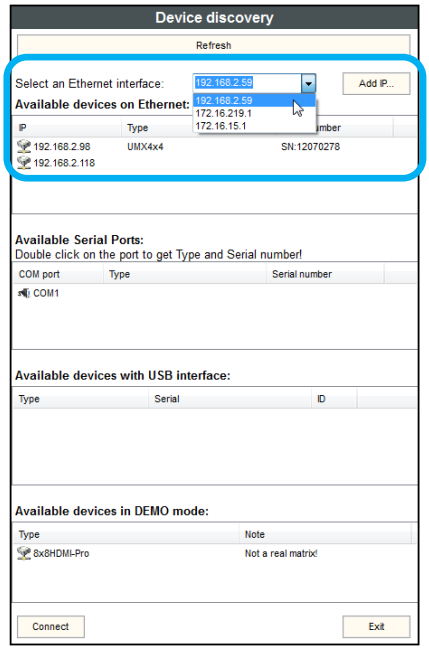


Figure 5-2.
Ethernet connection

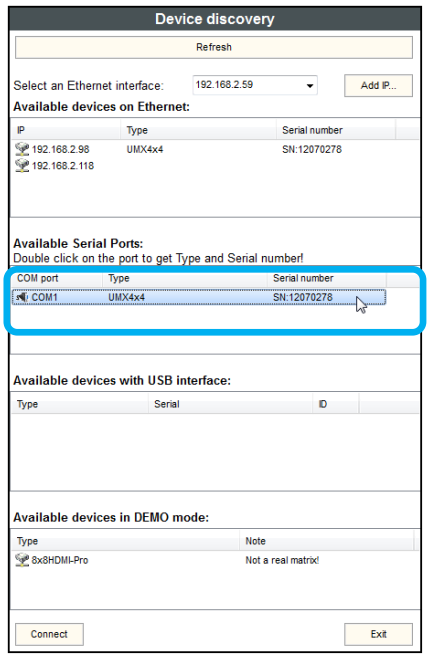


Figure 5-3.
Serial connection

Step 4. Click on the Connect button to connect to the device

Info: *If the router is not listed in the "available devices on Ethernet" box, try searching again, or see the trouble shooting guide in section 9.3 about TCP/IP connection problems on page 123.*

Info: *Be sure that the firewall is not blocking the application!*

When the Lightware Matrix Controller finds the hardware, it determines the product type, and the control menu appears. The current state of the crosspoint switch is displayed.

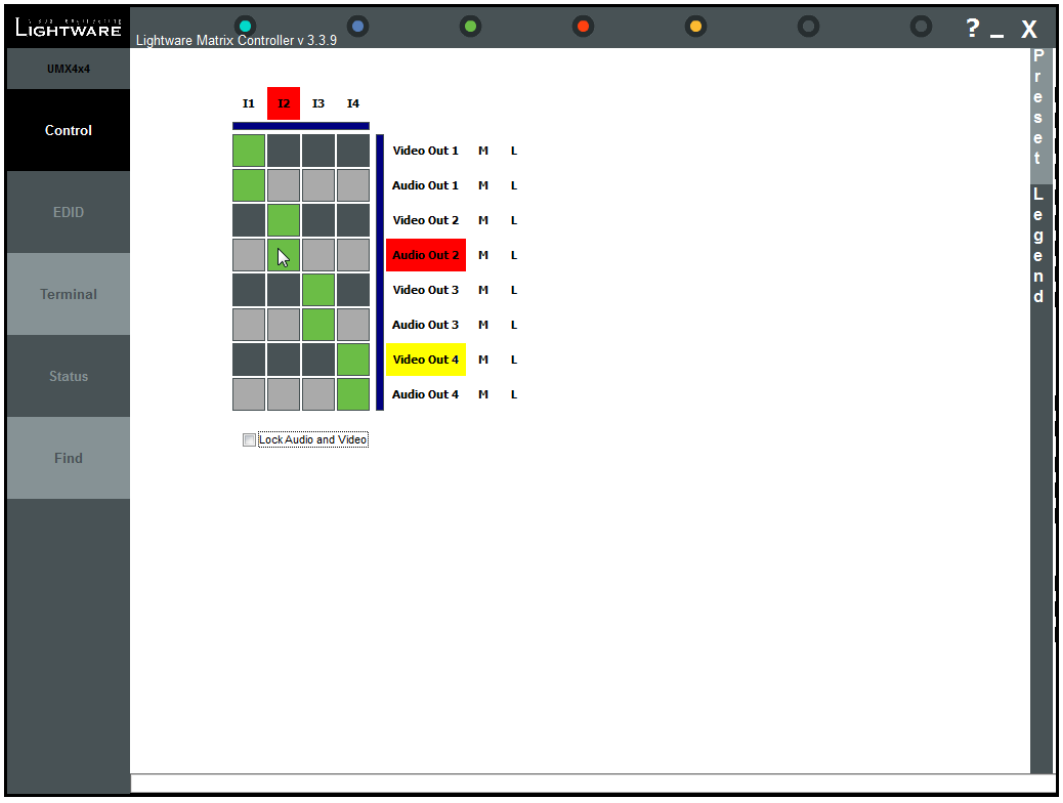


Figure 5-4. Matrix Controller crosspoint array

5.3. Control menu

This menu contains the crosspoint area and the preset area. After connecting to a new device, this menu appears by default.

This view adapts to the input and output numbers of the router. I1 .. I4 columns represent the inputs, the Video Out 1 .. Video Out 4 rows represent the video outputs and Audio Out 1 .. Audio Out 4 rows represent the audio outputs. Each green square represents an active connection. Since an input can be routed to more outputs simultaneously, there can be one or more green squares in one column. However an output can be switched to only one input, so there can be only one green square in any row.

5.3.1. Port status display

To help identifying connected sources and sinks, the background of input and output port labels are colored depending on port status.

If the mouse pointer hovers over an input our output port label, a hint message will come up showing the port's name and its status information.

Legend for input ports	Legend for output ports
No source connected; or no information available	No sink connected; or no information available
+5V is present from the source; (source connected)	Hotplug is present
DVI signal is present	
HDMI signal is present	
Analog signal is present	

5.3.2. Input and output names

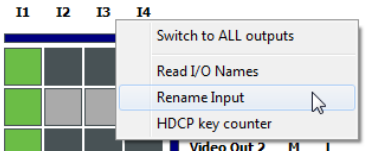
To help memorizing the connected sources and destinations, names can be assigned to inputs and outputs. I/O names can be maximum 15 characters long, and can contain any ASCII characters except: ( ) { }. All characters are converted to uppercase.

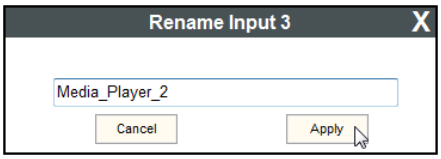
Rename I/O port

Step 1. Right click on the desired input or output.

Step 2. Click Rename Input (or Output) in the popup menu. The Rename window appears.

Step 3. Type the desired name, and click Apply.





Read I/O names

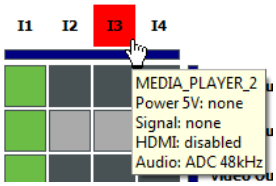
I/O names are loaded automatically when connection to the router is established. However I/O names can be re-read manually as well.

Step 1. Right click on any input or output.

Step 2. In the popup menu click Read I/O names.

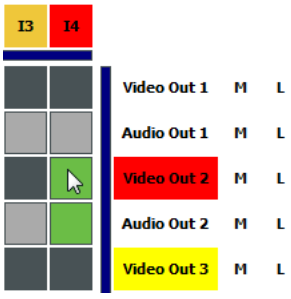
The result can be red in the terminal window or in the quick I/O port information.

5.3.3. Quick I/O port information



If the mouse pointer is moved above an I/O port label, a tooltip comes up showing the main information about the port status. The port name, the incoming signal and connection status can be checked. Output status shows only port name and connections.

5.3.4. Switch, mute and lock



For making a connection click on the desired square. If the output port is not locked, then the connection will be made. For example input 4 is connected to video and audio output 2 according to the picture on the right. For switching an input to all outputs, click with the right mouse button on the input label, and click "Switch to all outputs" in the popup menu.

Outputs can be easily muted by clicking on the button titled 'M' beside the output. This means that no signal is present at this output. If mute is active, the color of the button's background changes to black.

Outputs can be locked to any input. After locking an input to an output, no switching is permitted to this output unless it is unlocked again. If output lock is active, the color of the button's background changes to red.

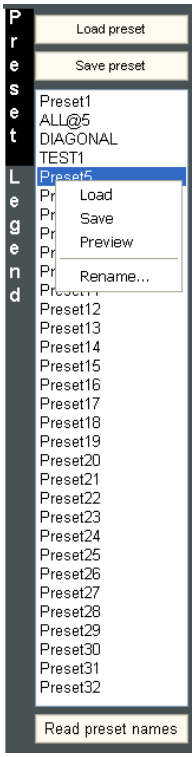
Info: *Loading a preset doesn't alter either the lock state or the switch state of a locked output. If an output is locked to an input before preset loading it will also be locked to that input after preset loading, so locked outputs ignore the preset.*

5.3.5. Preset operations

Preset operations can be done on the PRESET panel. The panel can be accessed by clicking on the vertical 'Preset' label at the right margin of the software window. Each Lightware matrix switcher has 32 preset memories that can be loaded and saved at any time.

Info: *A preset setting stores a full configuration of all outputs, so preset loading have an effect on every output, except the locked ones.*

Load preset



Step 1. Open the Preset panel on the right of the software window.

Step 2. Select the preset memory (Preset1...Preset32) you want to load as the next crosspoint configuration.

Step 3. Press LOAD PRESET button or right click on the desired preset, and click Load in the popup menu. Now the preset is loaded.

Step 4. The new I/O configuration is displayed on the matrix switching area.

Save preset

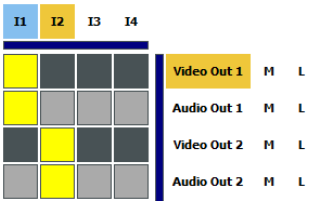
Step 1. Make the desired crosspoint connections on the matrix switching area.

Step 2. Select the preset memory (Preset1...Preset32) where you want to save your current crosspoint connections.

Step 3. Press SAVE PRESET button or right click on the preset and click Save in the popup menu.

Step 4. A confirmation message comes up. Click YES to save the current crosspoint connections to the selected preset memory. The preset is stored.

Preview preset



Step 1. Right click on the desired preset, and click Preview in the popup menu.

Step 2. The preset's I/O configuration is displayed on the matrix switching area with yellow squares for two seconds.

5.3.6. Preset names

To help memorizing the preset configurations, names can be assigned to saved presets. Preset names can be maximum 15 characters long, and can contain any ASCII characters except: ( ) { }. All characters are converted to uppercase.

Rename preset

Step 1. Select the preset memory (Preset1...Preset32) you want to rename.

Step 2. Click RENAME... in the popup menu. The Rename window appears.

Step 3. Type in the desired name and click APPLY. Now the new preset name is stored.

Read preset names

The control software downloads the names automatically upon establishing connection to the matrix. Preset names can be re-read manually by clicking on the READ PRESET NAMES button in the preset area.

5.3.7. Input parameter settings

By clicking on an input label a dialog window appears showing the parameters for the corresponding input.

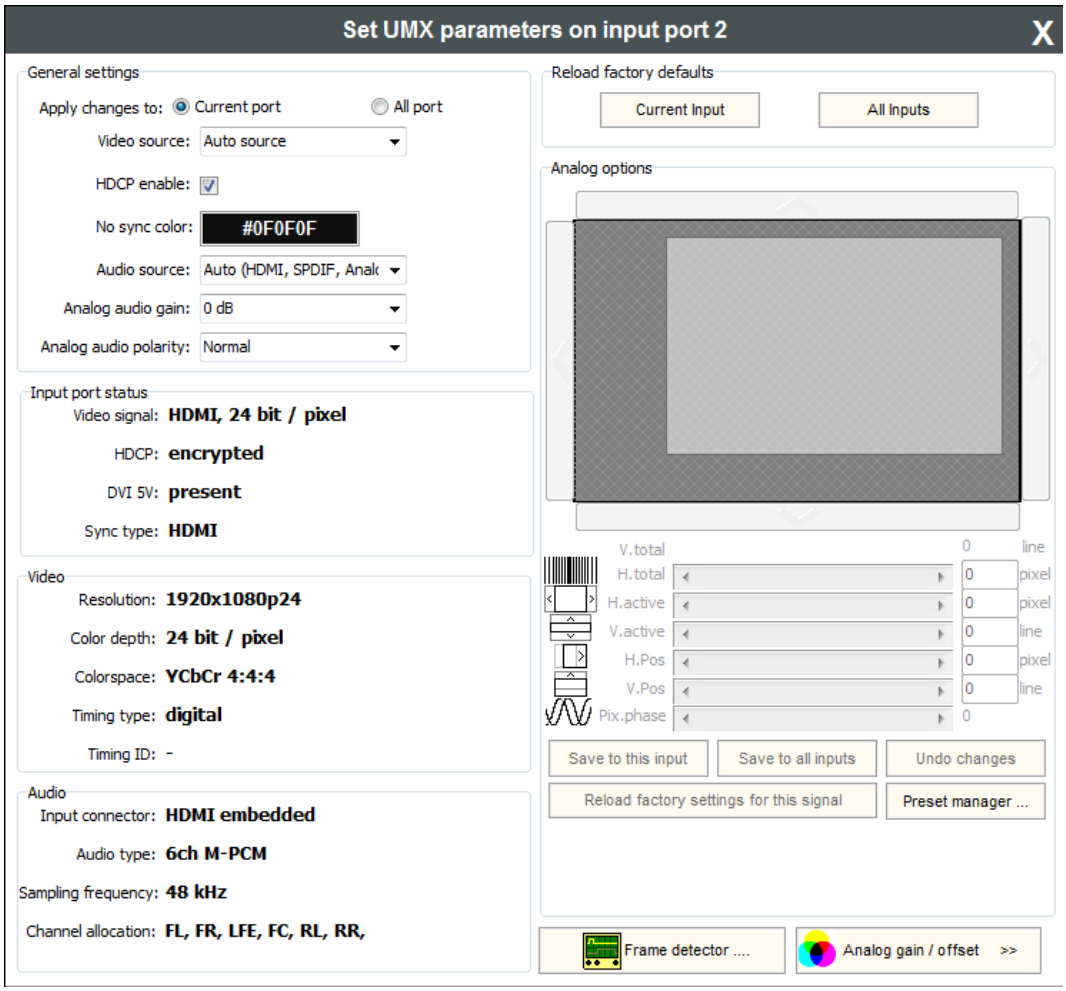


Figure 5-5. Input parameters for digital signal

Scope of changes

There are two options to apply changes. To set the scope of the changed settings, select the desired option in the top left box.

Apply changes to current input: this option means the modified parameters are applied only to the currently selected port.

Apply changes to all inputs: this option means that the modified parameters are applied to all input ports.

Info: *When opening this window again, the scope selection will be set to "Current Input" regardless of the active selection at the time of closing. It is to avoid making changes to all inputs by mistake.*

Reload factory defaults

Current input: Reloads the default values to the currently selected input.

All inputs: Loads the factory default values to all inputs.

Cable equalization

The amplitude of high frequency signals decreases after they pass through long distances in copper cables. To counter-act this phenomenon, input port can amplify the digital signal while maximizing the amplitude at a certain level, which is defined by the DVI 1.0 standard. This process is called equalization. The digital inputs are automatically compensated for up to 30-meter cable length.

General settings

Video Source

The signal type of the connected source can be selected in this drop down list: Analog RGB, Analog YUV, Analog auto, Digital, and Auto source. The Analog auto setting determines the color space of the connected analog video signal automatically. The Auto source setting accepts both digital and analog signals on the input and selects the one which is first detected.

Info *If the source signal type is unknown the recomended interface setting is the Auto.*

HDCP enable

The HDCP capability can be enabled or disabled on the input port with using the HDCP enable checkbox. This can prevent unnecessary HDCP encryption with certain source devices. Note that only unprotected content can be played on the source if this setting is disabled. For more information about HDCP handling see section 2.6 on page 14.

No sync color

The port generates a solid 640x480 resolution image when there is no incoming signal. The color of this picture can be set here. Double click on the colored field, a new window will appear. Choose the desired color then click the ‘OK’ button to apply changes. Click the Cancel button to discard changes and close the window.

Audio source

Three different audio sources can be connected to one input port at the same time. The ‘Audio source’ parameter selects which incoming audio signal will be placed on the selected output port. Select the desired option from the ‘Audio source‘ drop down list:

The audio source settings can be:

Mute, HDMI, Analog, SPDIF

Auto (HDMI, Analog), Auto (SPDIF, Analog)

Auto (HDMI, SPDIF, Analog), Auto (SPDIF, HDMI, Analog)

If only one input is selected (**Analog** or **SPDIF** or **HDMI**) than only this type of audio can be placed on the output.

If **Mute** is selected than the matrix ignores the audio input signals.

Every **AUTO** value has a priority order. The matrix checks the first item of the priority list. If there is a valid audio signal on that audio input the signal will be placed on the outputs. If there isn’t the matrix checks the second item of the priority list. And so on.

Info *If the second item of the priority list was selected (e.g. SPDIF) and the first item (e.g. HDMI embedded) appears on the input UMX4x4-Pro selects the first one (HDMI embedded) immediately.*

Analog audio gain

Analog audio gain is the amplification of the built in preamplifier. It can be set up manually from 0 dB to 24 dB with 3 dB steps.

Analog audio polarity

If there is a phase reverse item in the amplifier chain the analog audio signal can be compensated by changing the polarity in the UMX4x4-Pro. It can be set up manually to 0 degree (Normal) or 180 degree (Inverted).

DC filter

Removes the DC component from the analog audio signal if it is enabled.

Input port status

Connection status of the selected input port is shown here. (Type of the video signal, HDCP encryption, the source 5V, sync type)

Video

Resolution, color depth and color space of the incoming signal are shown here.

The 'Timing type' and 'Timing ID' fields show which parameters are used to digitize the incoming analog signal. The input port measures the incoming analog signal and determines the timings. If the parameters need adjustment, it can be done on the right side at 'analog options'. In this case the 'Timing ID' field changes to 'user modified' unless the parameters are not saved.

Audio

Information about the embedded audio signal is shown here. (Input connector, audio type, sampling frequency, channel allocation)

Analog video options

Analog video signals are digitized on the input. The timing parameters can be adjusted here if needed. Timing presets can be saved for each resolution separately.

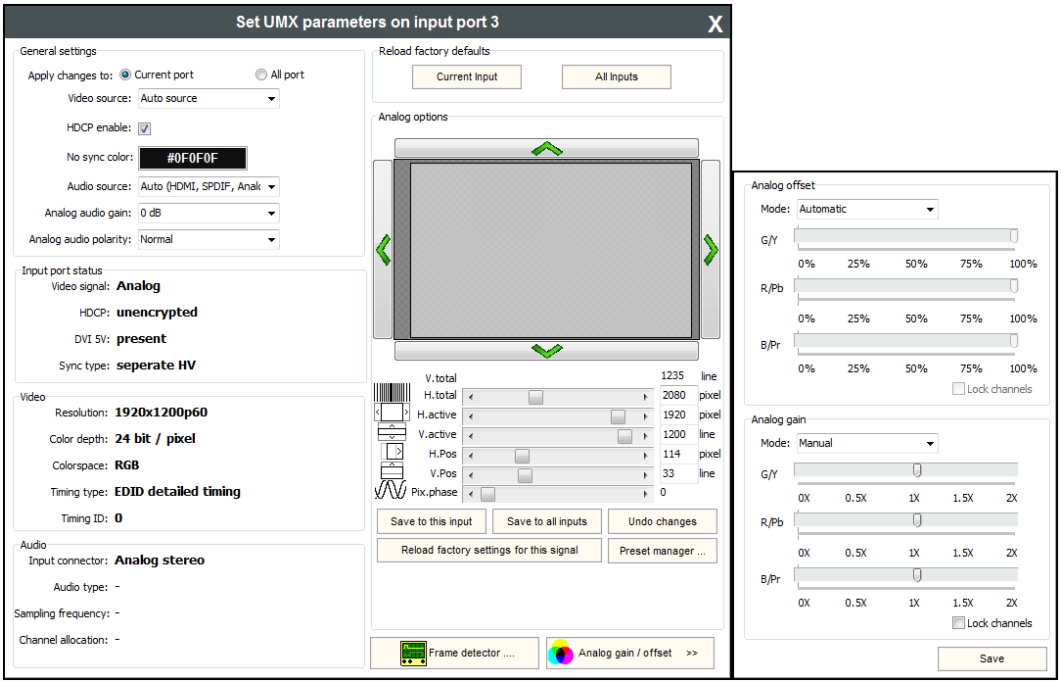
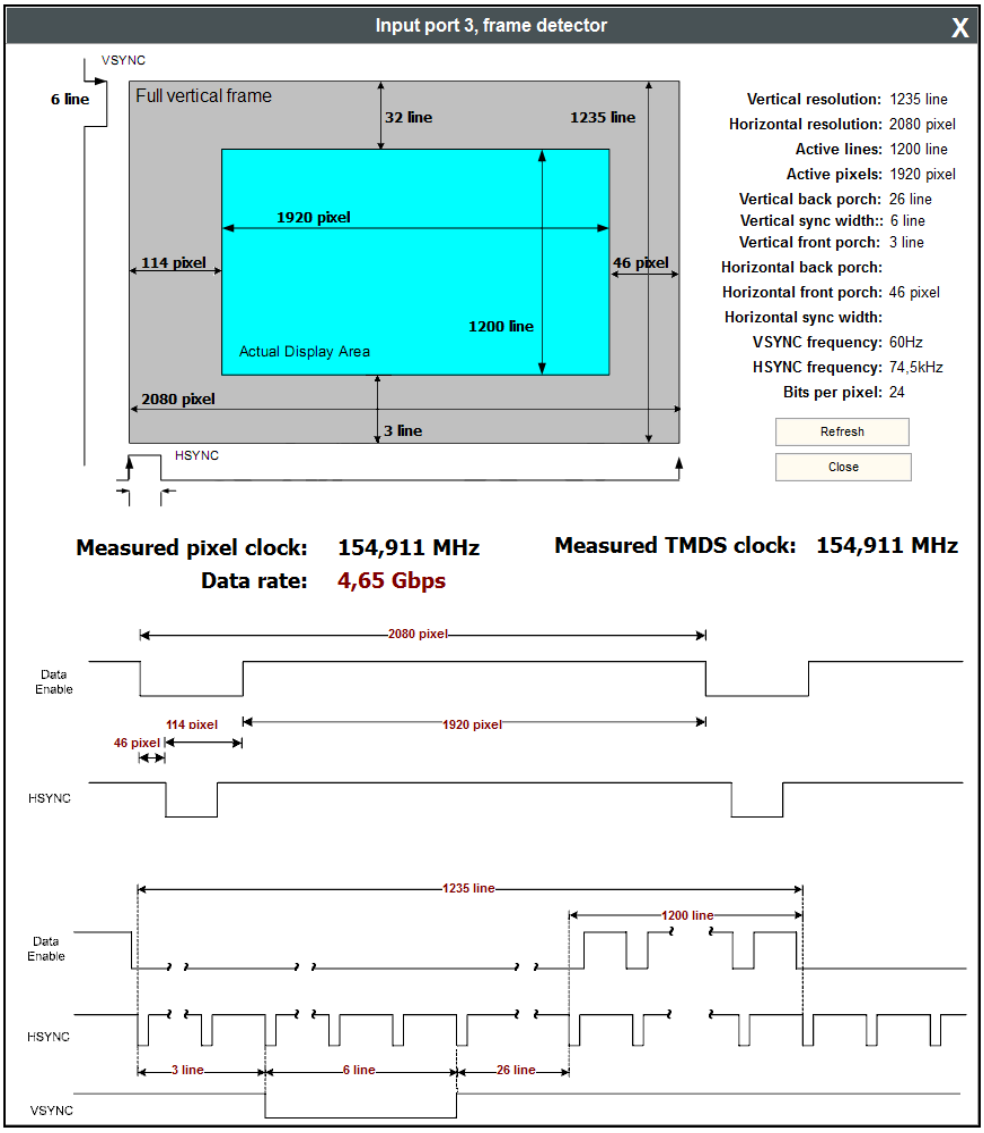


Figure 5-6. Input parameters for analog signal

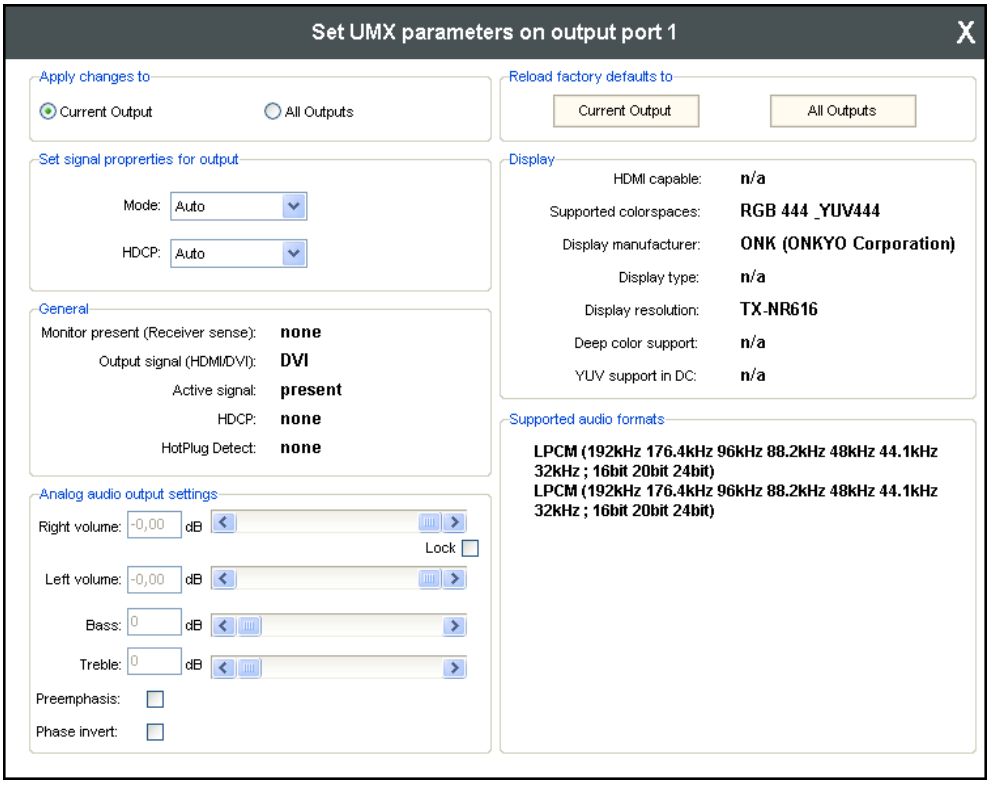
Frame detector

Click the frame detector button to view the measured detailed timings on the incoming signal.



5.3.8. Output parameter settings

By clicking on an output label a dialog window appears showing the parameters for the corresponding output.



Scope of changes

There are two options to apply changes. To set the scope of the changed settings, select the desired option in the top left box.

Apply changes to current output: this option means the modified parameters are applied only to the currently selected port.

Apply changes to all outputs: this option means that the modified parameters are applied to all output ports.

Info: *When opening this window again, the scope selection will be set to "Current Output" regardless of the active selection at the time of closing. It is to avoid making changes to all outputs by mistake.*

Reload factory defaults

Current output: Reloads the default values to the currently selected output.

All outputs: Loads the factory default values to all outputs.

Output properties

Mode

The 'Mode' can be set to Auto, DVI, HDMI 24bit, HDMI 30bit or HDMI 36bit. The 'Auto' option sets the signal mode regarding to the attached display device's EDID and the incoming signal.

HDCP

The 'HDCP' option sets the HDCP encryption on the output. The Auto setting applies encryption when the incoming signal is encrypted. The Always setting forces encryption on any incoming video signal.

General

Information about the signal and the connection status is shown here.

Analog audio

The volume, balance, treble and bass adjustment can be set up regarding the analog stereo output.

Display

Information retrieved from the connected display's EDID is shown.

Supported audio formats

The connected display's supported audio formats are shown based on the read EDID.

5.4. EDID menu

Advanced EDID Management can be accessed by clicking on the EDID menu. This view is divided in two segments. The upper segment can be opened by clicking the green arrow. This segment contains the EDID editor. The lower segment is the EDID router area. This consists of two list windows, which can display a selected part of the EDID memory.

Info *When the user enters the menu for the first time, the software starts to download the whole EDID list from the matrix. It may take about 30-40 seconds.*

5.4.1. EDID Router operation

After the list is downloaded, the current status is shown. The EDID memory consists of four parts. Any memory part can be displayed on either side by using the drop down lists.

The **Emulated EDID List** shows the currently emulated EDIDs for each input. It contains the resolution, manufacturer and vendor name of the EDID reported to the sources for each input separately. The source column displays the memory location that the current EDID was routed from.. The rows with red background are EDIDs routed from dynamic memory.

The **Last attached Monitor's EDID List** contains the resolution, manufacturer and vendor name of the display devices connected to matrix switcher's output. The matrix remembers the last display device's EDID, so there is an EDID shown even if there is no device attached to the router's output at the moment.

The **Factory EDID List** shows the factory memory locations (01# - 89#) with preprogrammed EDID.

The **User EDID List** shows the memory locations (1# - 50#) which can be used by the user to save custom EDIDs.

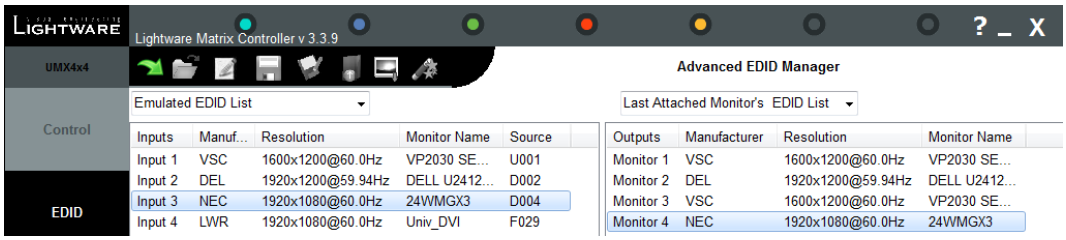

LIGHTWARE
Lightware Matrix Controller v 3.3.9
UMX4x4
Control
EDID
Advanced EDID Manager
Emulated EDID List
Last Attached Monitor's EDID List
Inputs Manuf... Resolution Monitor Name Source
Input 1 VSC 1600x1200@60.0Hz VP2030 SE... U001
Input 2 DEL 1920x1200@59.94Hz DELL U2412... D002
Input 3 NEC 1920x1080@60.0Hz 24WMGX3 D004
Input 4 LWR 1920x1080@60.0Hz Univ_DVI F029
Outputs Manufacturer Resolution Monitor Name
Monitor 1 VSC 1600x1200@60.0Hz VP2030 SE...
Monitor 2 DEL 1920x1200@59.94Hz DELL U2412...
Monitor 3 VSC 1600x1200@60.0Hz VP2030 SE...
Monitor 4 NEC 1920x1080@60.0Hz 24WMGX3

Figure 5-7. EDID Management menu

Any DVI source reads the EDID from the Emulated EDID memory for the corresponding port. The user can copy an EDID from any of the three EDID lists to the desired input's memory location. This is called EDID routing. There are two types of the emulation: static and dynamic.

- Static EDID emulation happens, when an EDID from the Factory or User EDID list is routed to an input
- Dynamic EDID emulation occurs, when an attached monitor's EDID is routed to an input. In this case the emulated EDID changes automatically, if a new monitor is attached to the output, by simply copying the data from the monitor.

Changing the emulated EDID at one or all inputs

Step 1. Select the Emulated EDID List in one of the list window areas in the drop down list.

Step 2. Select the desired EDID list in the other list window from which you want to copy (route) the EDID.

Step 3. To change the emulated EDID at

a) one input, drag and drop the EDID to the desired input location.

b) all inputs at the same time, right click on the desired new EDID and select "Switch to all Inputs" from the pop-up menu.

Step 4. Click Yes in the pop-up dialog window to confirm EDID change.

Info: *If dynamic emulation is established, the emulated EDID will be changed on all inputs that are affected, every time a new monitor is connected to the output which was the source of the dynamic EDID routing. If the monitor is disconnected from the output, the last EDID remains emulated for the sources. This feature helps especially rental technicians or system integrators to keep the source continuously transmitting the signal, and adopt the system for new incoming display devices.*

Info: *Power ON/OFF cycle will not affect the emulated EDID or other settings.*

Info: *EDID routing procedure causes a status change, hence it is reported back to the CONTROL SOFTWARE within 2-3 seconds.*

Learning EDID from attached display device

The system is able to learn the EDID from a connected display device and store it in one of the user programmable memory locations.

Step 1. Select the User Memory in the drop-down menu in one of the list windows.

Step 2. Select the EDID to be saved from the other list window.

Step 3. Drag and drop the selected EDID to the desired User Memory location.

Step 4. Click Yes in the pop-up dialog window to confirm EDID change.

Saving EDID from memory to file

The control software is able to download EDID from the matrix and to save it as an EDID file (.dat file extension).

Step 1. Right click on the EDID to be saved.

Step 2. Click on the "Save to file" in the pop-up window.

Step 3. The Matrix Controller Software downloads the desired EDID and a save dialog appears. It may take a few seconds to download the EDID. If the save dialog is shown, type in the file name, and press Save button. After the process was completed, an "EDID saved!" message confirms the command.

Load EDID from file to memory

The system is able to load EDID from a file located on the computer and store it in the matrix. EDID are stored in *.dat files.

Step 1. Select the User Memory list in one of the list windows

Step 2. Right click on the desired memory location. Then select “Load from file” from the pop-up menu.

Step 3. Browse your hard drive to find the desired EDID file. The software checks whether the selected file is a valid EDID file.

Step 4. Click Open in the browser window. After the process finished, ”EDID Upload completed” message appears.

Synchronizing EDID lists

By clicking “Synchronize EDID List” button the Lightware Matrix Controller software rereads all EDID information from the connected matrix switcher. During normal operation it is not necessary to use this function because the matrix switcher always reports every status change automatically.

Info: *There is always a small delay in responses. So if a new monitor is connected to the output its new EDID is not shown immediately but in 2-3 seconds!*

Info: *As the matrix switcher reports status change nothing will happen if you select the same EDID to a given input or connect the same display device to a given output!*

5.4.2. Advanced EDID Editor

This powerful tool is essential for AV professionals. The Lightware Advanced EDID Editor is integrated into the Lightware Matrix Controller software, and it makes possible to manage every setting in the EDID on an intuitive user interface. The editor can read and write all descriptors, which are defined in the standards, including the additional CEA extensions.

Any EDID from the router’s memory or a saved EDID file can be loaded in the editor. The software resolves the raw EDID, and displays it as readable information to the user. All descriptors can be edited, and saved in an EDID file, or uploaded to the router’s memory.

By clicking on the green arrow, the editor area rolls down.

When the user enters the menu for the first time, an empty EDID is loaded into the editor’s memory.

All EDID in the router’s memory can be edited in the following way:

Step 1. Right click on the desired EDID to be loaded to the EDID Editor.

Step 2. In the pop-up menu, click on Edit EDID. The editor area automatically rolls down, and the EDID is loaded into the editor area.

For further information, see the user’s manual of Advanced EDID Editor on the Lightware website: www.lightware.eu.

5.4.3. Easy EDID Creator

Since the above mentioned advanced editor needs more complex knowledge about EDID, Lightware introduced a wizard like interface for fast and easy EDID creation. With Lightware Easy EDID Creator it is possible to create custom EDIDs in four simple steps.

By clicking on the wizard icon, the Easy EDID Creator opens in a new window.

For further information, see the user's manual of Easy EDID Creator on the Lightware website: *www.lightware.eu*.

5.5. Terminal menu

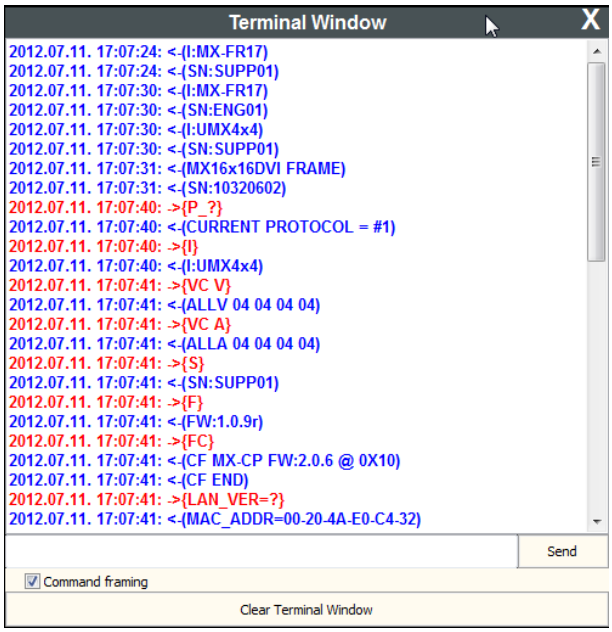


Figure 5-8. Terminal window

This general-purpose serial terminal is intended mainly for testing and debugging purposes. After a successful connection is established with a router this terminal can be used either via serial or TCP/IP connection. All commands can be used here that are discussed in the Programmers reference, chapter 7 on page 80. The text can be typed directly.

By default commands are automatically surrounded by framing brackets. Every sent command and every received response gets an arrow (-> or <-) prefix, and has different font colors in order to help distinguishing.

If the "Command framing" checkbox is unchecked, you can send multiple commands together, however in this case you have to type in the framing brackets manually.

5.6. Status menu

Basic device information, such as the installed boards' firmware and hardware revisions are displayed in this window.

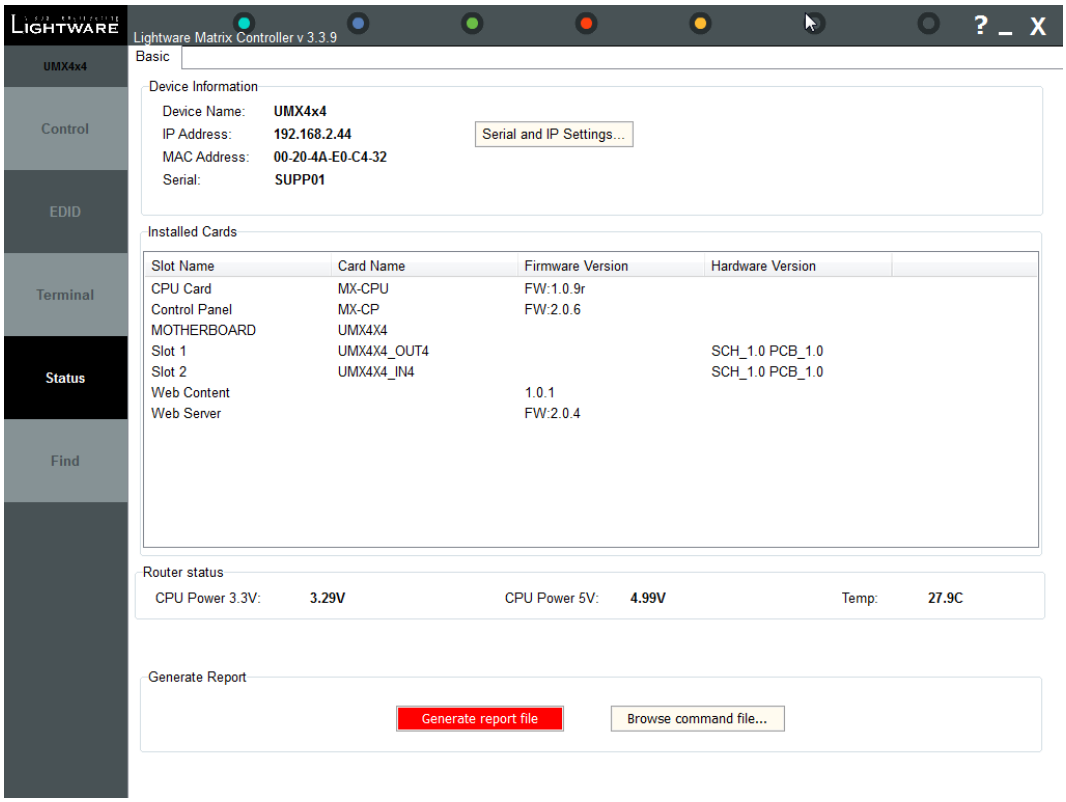
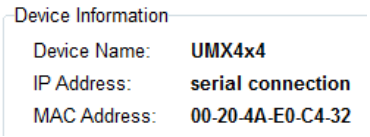


Figure 5-9. Status menu

Info: *If the device is connected via RS-232, the IP address field shows "serial connection" instead of the IP address.*



If the matrix is connected via IP connection, the serial and IP settings can be viewed by clicking on the "Serial and IP Settings..." button.

5.6.1. IP settings

Obtain IP address automatically

By selecting the "Obtain IP address automatically" option, the matrix gets the IP address from the DHCP server on the LAN, or if DHCP server is not present, it gets an AutoIP address from the 169.254.xxx.xxx domain.

Fix IP configuration

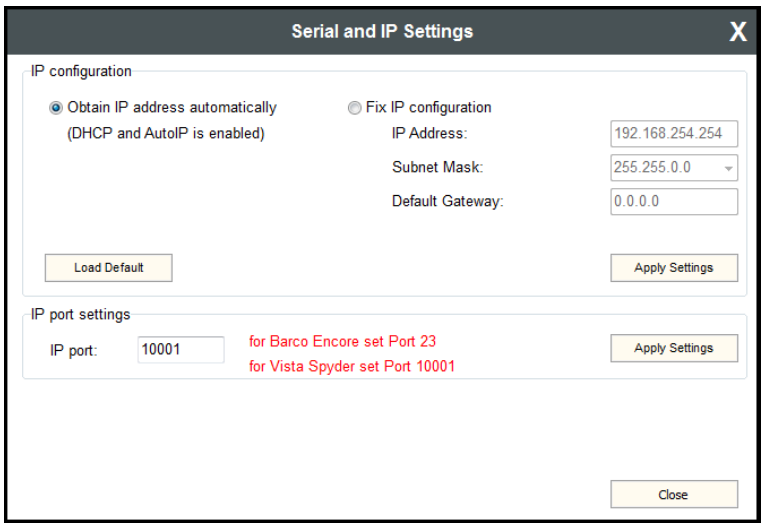
In this case, the matrix has an IP address configuration set up by the user/administrator. The earlier saved configuration is shown in brackets.

Step 1. Select the "Fix IP configuration" option.

Step 2. Type in the IP address, select the desired subnet mask and type in the gateway IP address.

Step 3. Click on "Apply Settings" button. Depending on the modified settings, you might need to restart the router and the Matrix Controller Software.

Step 4. Click to the Close button to close this window and step back to the Status menu.



Info: *The "Load Default" button loads the factory default IP settings to the fields, which contain a fix configuration:*

IP Address: *192.168.254.254*
Subnet Mask: *255.255.0.0*
Default Gateway: *0.0.0.0*

IP port settings

The router can be accessed via this TCP/IP port number with TCP connection. This number can be modified to any number between 1025 - 65535 except the followings: 9999, 14000 - 14009, 30704, and 30718.

The port 23 is accepted for Barco Encore. To use the matrix with the Vista Spyder set port to 10001.

Step 1. Type the desired port number into the textbox.

Step 2. Click on "Apply Settings" button. Depending on the modified settings, you might need to restart the router and the Matrix Controller Software.

Step 3. Step 4. Click to the Close button to close this window and step back to the Status menu.

Info: *The IP port number is 10001 by default.*

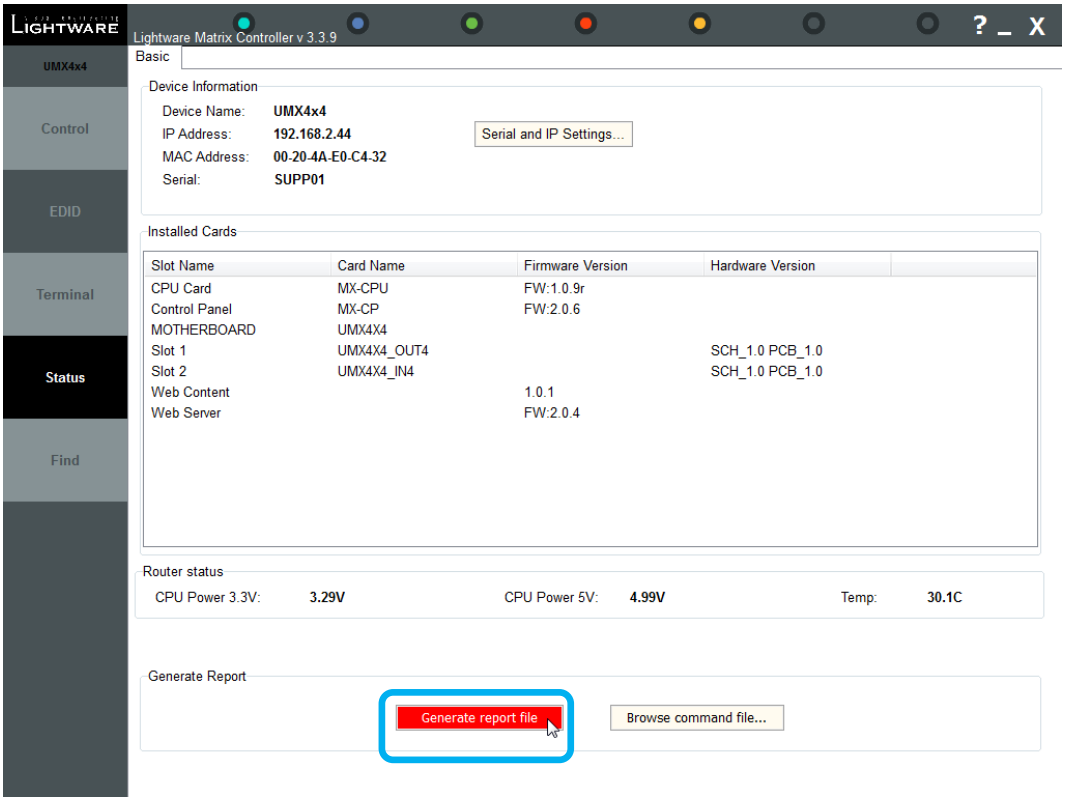
5.6.2. Generate report file

Lightware Matrix Controller allows user to generate a standard report file which contains basic information about the health and the version numbers of the matrix.

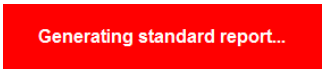
The default file name is:

Lightware_matrix_standard_report_dd_mm_yyyy@hh_mm.lwr

User's issues can be solved easier by Lightware technical support if the generated report file was sent.



During the process a big red message will be appeared:



Important *Let the Lightware Matrix Controller software to finish the process! Do not exit or select another menu item.*

After finishing a window explorer will be opened and shown the actual folder which contains the generated report file.

5.6.3. Browse command file

Lightware Matrix Controller software can run a special command file. After running the software save a result file. It is useful for debugging for the Lightware technical support.

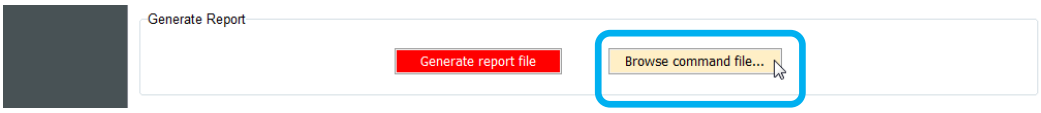
If a command file was sent:

Step 1. Save it to the computer.

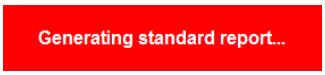
Step 2. Click to the 'Browse command file…' button. A browser window will be opened.

Step 3. Choose the command file. Another browser window will be appear where the generated result file will be saved.

Important *Let the Lightware Matrix Controller software to finish the process! Do not exit or select another menu item.*



During the process a big red message will be appeared:

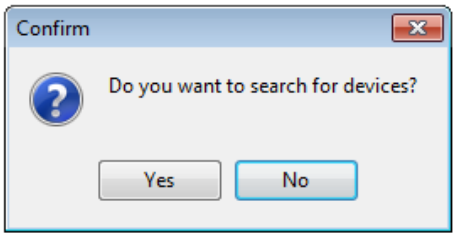


5.7. Find menu

By clicking this menu, the available devices can be rescanned on the serial port and on the Ethernet. If the Matrix Controller Software has a live connection to a device on a port, a question window appears, asking if you really want to search for devices.

Clicking Yes will open the Find window. See section 5.2 about establishing the connection on page 45.

Clicking No will close the pop up window, the original connection remains active.



6. Web control – Using built-in website

Lightware matrices have a built-in web page, which can be accessed over TCP/IP protocol and offers you full control over all settings even if you don't have the opportunity to install new programs. The router's built-in website is compatible with most widely spread browsers and requires no additional software components such as ActiveX controls.

To access the webpage just run your preferred web browser and type the IP address of the router as URL. The computer and the router have to be in the same subnet.

Info: *The only way to find out the router's IP address (if it is not known) is to search for devices with the Matrix Controller software. If this is not possible for some reason, the IP address can be reset to factory default (192.168.254.254) with the front panel buttons. See section 4.5.4 on page 42 for details.*

Info: *Only one opened web page is allowed simultaneously. Other TCP/IP connections are prohibited while the web page is opened. Using more instances of the web page simultaneously will result in inadequate operations.*

Info *Some of the Lightware Matrix Controller functions are not available in the built-in website. Please read section 4.5 to compare the user interfaces.*

6.1. Establishing the connection

Step 1. Connect the matrix switcher and the computer either via

- Ethernet, with LAN patch cable (to a Hub, Switch or Router)
- Ethernet, with LAN cross cable (directly to Computer)

Info *If the connection is made through the router's Ethernet port, be sure that the computer is in the same network as the router.*

Info *If the computer has multiple Ethernet connections (for example WiFi and LAN connections are used simultaneously) you will have to know the IP address for the one that is used for controlling the matrix.*

Step 2. Change to the desired IP settings if it is needed.

Step 3. Check the IP address of the matrix on the front panel LCD.

Step 4. Type the IP address to the address bar of the web browser. After a few seconds the control menu appears. The current state of the crosspoint switch is displayed.

6.2. Menu description

The built-in website contains the following menus and submenus:

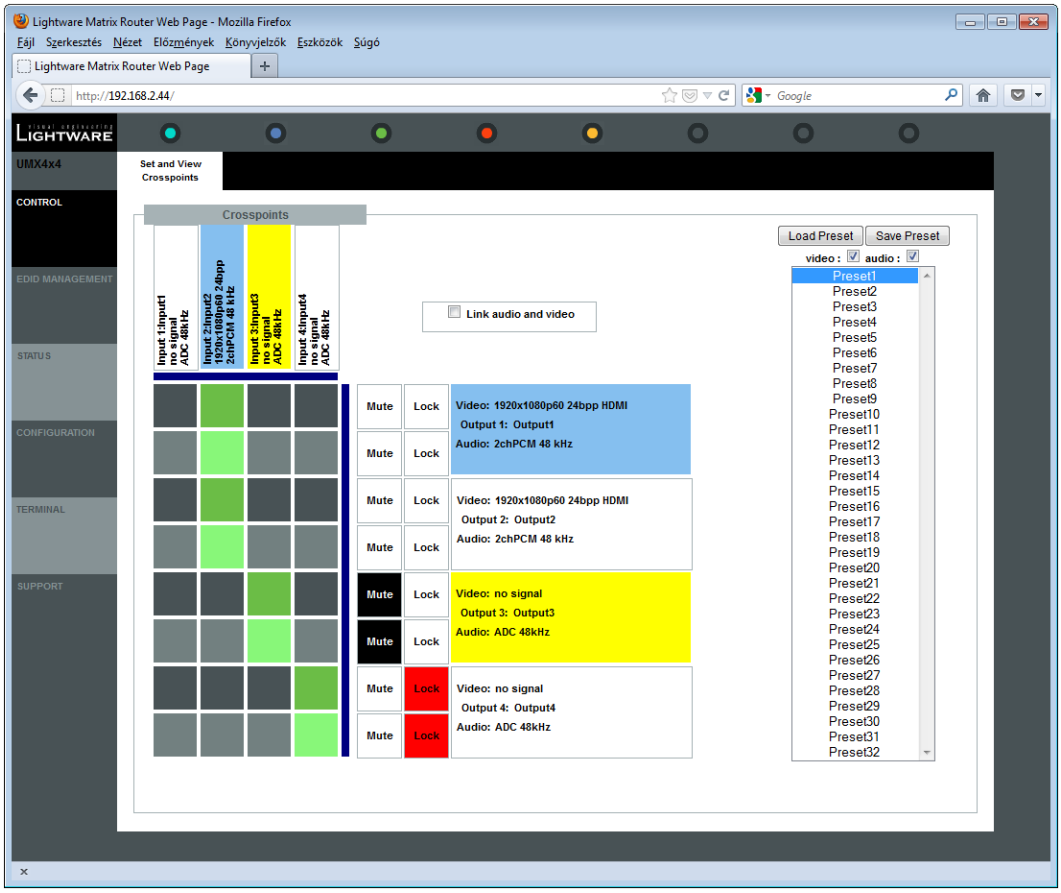


Figure 6-1. Built-in website main page

Control

Set and View Crosspoints

This menu appears by default, when accessing the website.

It contains a matrix button area according to the input and output numbers of the router. Columns are representing the inputs, while rows are the outputs. The green squares represent the state of the matrix switcher.

The Preset selection box is on the right side of this page.

Input or output parameter windows can be reached by clicking on the input or output names.

EDID Management

By clicking on this menu, the built-in website downloads the EDID list from the matrix. The user can view and switch the EDIDs.

Status

Basic device information such as the serial number, installed cards firmware, and hardware versions are displayed on this page.

Configuration

This page shows the current network configuration of the matrix, such as IP settings and port number.

Terminal

The general-purpose web terminal is intended mainly for testing and debugging purposes.

Support

The contact information to Lightware Visual Engineering is shown in this page.

6.3. Control menu

6.3.1. Port status

To help identifying connected sources and sinks inputs' and outputs' name and the information of the presented audio and video signal are shown. The background of input and output port labels are colored depending on port status.

Legend for input ports	Legend for output ports
No source connected; or no information available	No sink connected; or no information available
+5V is present from the source; (source connected)	Hotplug is present
DVI signal is present	
HDMI signal is present	
Analog signal is present	

6.3.2. Crosspoint switching

This menu contains the crosspoint area and the preset area. After connecting to a new device, this menu appears by default.

Input 1 .. Input 4 columns represent the inputs, the Video Output 1 .. Video Output 4 rows represent the video outputs and Audio Output 1 .. Audio Output 4 rows represent the audio outputs. Each green square represents an active connection. Since an input can be routed to more outputs simultaneously, there can be one or more green squares in one column. However an output can be switched to only one input, so there can be only one green square in any row.

6.3.3. Mute outputs

Outputs can be easily muted by clicking the button titled 'M' beside the output. This means that no signal will be present at this output. If muting is active the background turns to black.

6.3.4. Lock outputs

Outputs can be locked to any inputs. After locking an input to an output no switching is permitted for this output unless it is unlocked again. If lock is active, background turns to red.

Info: *Loading a preset doesn't change neither the lock state nor the switch state of a locked output. If an output is locked to an input before preset loading, it will also be locked that input after preset loading, so locked outputs ignore the preset.*

6.3.5. Input and output names

To help memorizing the connected sources and destinations, names can be assigned to inputs and outputs. I/O names can be maximum 15 characters long, and can contain any ASCII characters except: ( ) { }. All characters are converted to uppercase.

Rename I/O port

Step 1. Click on the desired name of the input or output port exactly. A message box will be active.

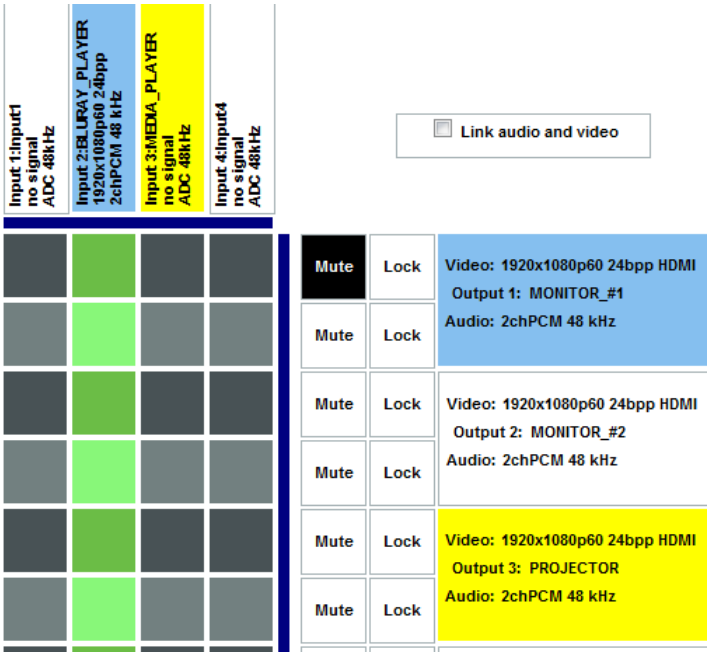
Step 2. Type the desired name of the input or output port.

Step 3. Hit ENTER to apply changes.

Read I/O names

I/O names are loaded automatically when connection to the router is established and shown in the control menu window. To reload the port names refresh the webpage with the web browser.

6.3.6. Quick I/O port information

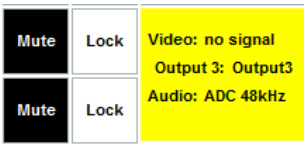


The name of the inputs and outputs, resolution and the type of the video and audio signals can be red when crosspoint status is shown. The background of input and output port labels are colored depending on port status.

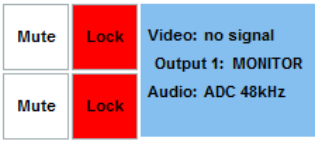
6.3.7. Switch, mute and lock

For making a connection click on the desired square. If the output port is not locked, then the connection will be made. For example input 3 is connected to video and audio output 3 according to the picture on the right.

Outputs can be easily muted by clicking on the button titled 'M' before the output. This means that no signal is present at this output. If mute is active, the color of the button's background changes to black.



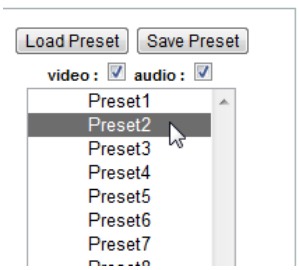
Outputs can be locked to any input. After locking an input to an output, no switching is permitted to this output unless it is unlocked again. If output lock is active, the color of the button's background changes to red.



Info: *Loading a preset doesn't alter either the lock state or the switch state of a locked output. If an output is locked to an input before preset loading it will also be locked to that input after preset loading, so locked outputs ignore the preset.*

6.3.8. Preset operations

Preset operations can be done on the PRESET panel. The panel can be found on the right side of the window. Each Lightware matrix switcher has 32 preset memories that can be loaded and saved at any time.



Info: *A preset setting stores a full configuration of all outputs, so preset loading have an effect on every output, except the locked ones.*

Load preset

Step 1. Select the preset memory (Preset1...Preset32) you want to load as the next crosspoint configuration.

Step 2. Press Load Preset button. Now the preset is loaded.

Step 3. The new I/O configuration is displayed on the matrix switching area.

Save preset

Step 1. Make the desired crosspoint connections on the matrix switching area.

Step 2. Select the preset memory (Preset1...Preset32) where you want to save your current crosspoint connections.

Step 3. Press SAVE PRESET button.

Step 4. A confirmation message comes up. Click YES to save the current crosspoint connections to the selected preset memory. The preset is stored.

6.3.9. Input parameter settings

By clicking on an input label a dialog window appears showing the parameters for the corresponding input.

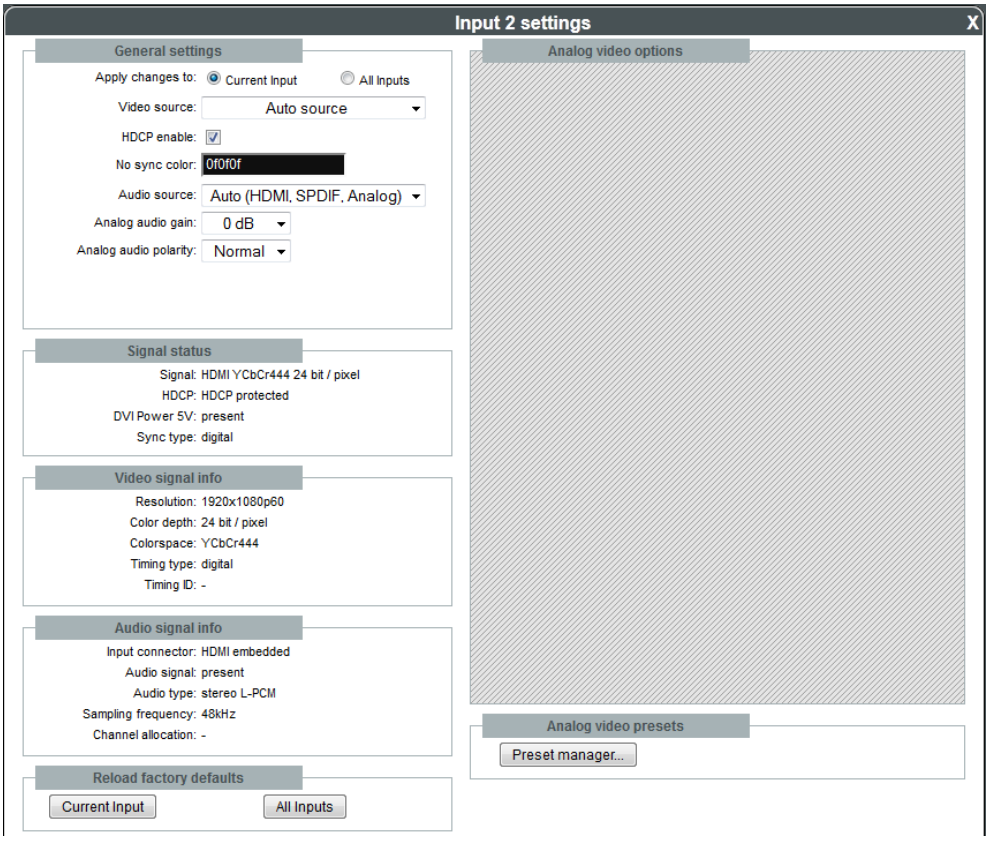


Figure 6-2. Input settings for digital signal

Scope of changes

There are two options to apply changes. To set the scope of the changed settings, select the desired option in the general settings box.

Apply changes to current input: this option means the modified parameters are applied only to the currently selected port.

Apply changes to all inputs: this option means that the modified parameters are applied to all input ports.

Info: *When opening this window again, the scope selection will be set to "Current Input" regardless of the active selection at the time of closing. It is to avoid making changes to all inputs by mistake.*

Reload factory defaults

Current input: Reloads the default values to the currently selected input.

All inputs: Loads the factory default values to all inputs.

General settings

Video Source

The signal type of the connected source can be selected in this drop down list: Analog RGB, Analog YUV, Analog auto, Digital, and Auto source. The Analog auto setting determines the colorspace of the connected analog video signal automatically. The Auto source setting accepts both digital and analog signals on the input and selects the one which is detected first.

HDCP enable

The HDCP capability can be enabled or disabled on the input port. This can prevent unnecessary HDCP encryption with certain source devices. Note that only unprotected contents can be played on the source if this setting is disabled.

No sync color

The port generates a solid 640x480 resolution image when there is no incoming signal. The color of this picture can be set here. Double click on the colored field, a new window will be appeared. Choose the desired color then click to 'OK' button to apply changes. Click to Cancel button to discard changes and close the window.

Audio source

The audio signal type of the connected source can be selected in this drop down list: Mute, HDMI audio, Analog audio, SPDIF audio, Auto (HDMI, SPDIF, Analog), Auto (SPDIF, HDMI, Analog), Auto (HDMI, Analog), Auto (SPDIF, Analog).

The Auto (…) setting determines the type of the connected audio signals automatically and selects the one which is detected first from the list.

Analog audio gain

Analog audio gain can be set up manually from 0 dB to 24 dB with 3 dB steps.

Analog audio polarity

DC filter

Remove DC component from the analog audio signal if it is enabled.

Signal status

Connection status of the selected input port is shown here.

Type of the video signal, HDCP encryption, 5V present,

Video info

Resolution, color depth and colorspace of the incoming signal are shown.

The 'Timing type' and 'Timing ID' fields show which parameters are used to digitize the incoming analog signal. The input port measures the incoming analog signal and determines timings. If the parameters need adjustment, it can be done on the right side at 'analog options'. In this case the 'Timing ID' field changes to 'user modified' till the parameters are not saved.

Audio info

Information about the embedded audio signal is shown.

Reload factory defaults

Current input: Reloads the default values to the currently selected input.

All inputs: Loads the factory default values to all inputs.

Analog video options

Analog video signals are digitized on the input. The timing parameters can be adjusted here if needed. Timing presets can be saved for each resolution separately.

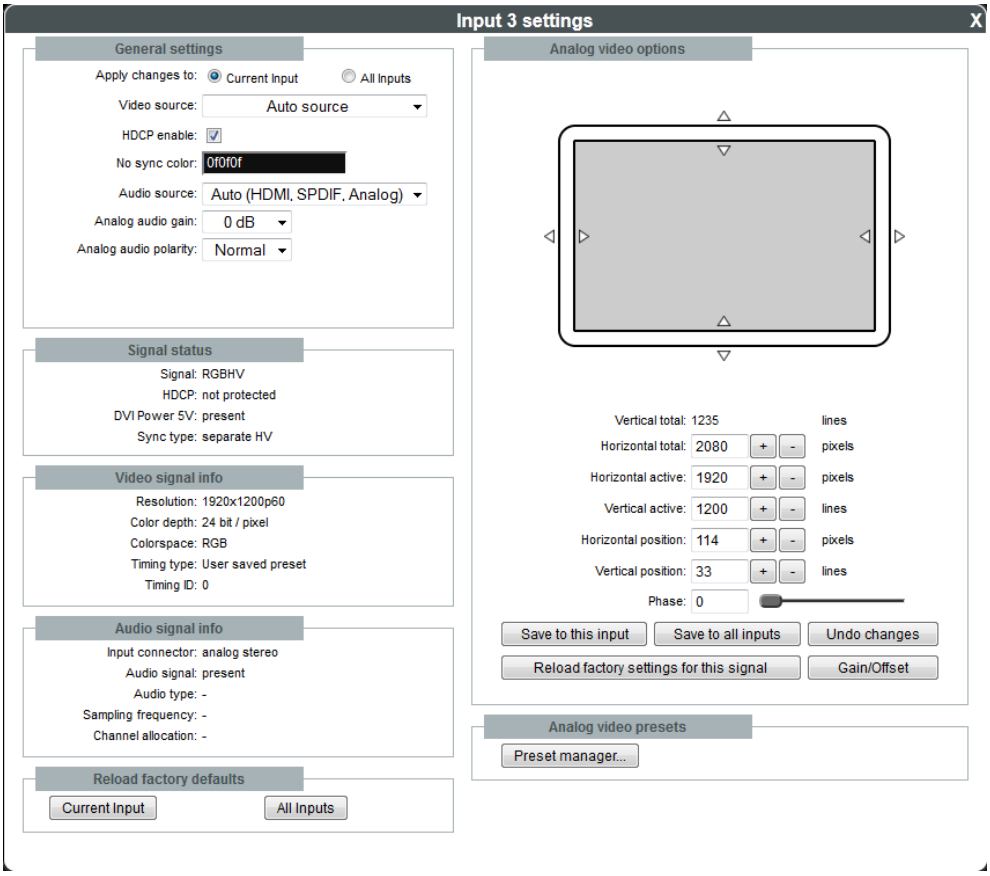
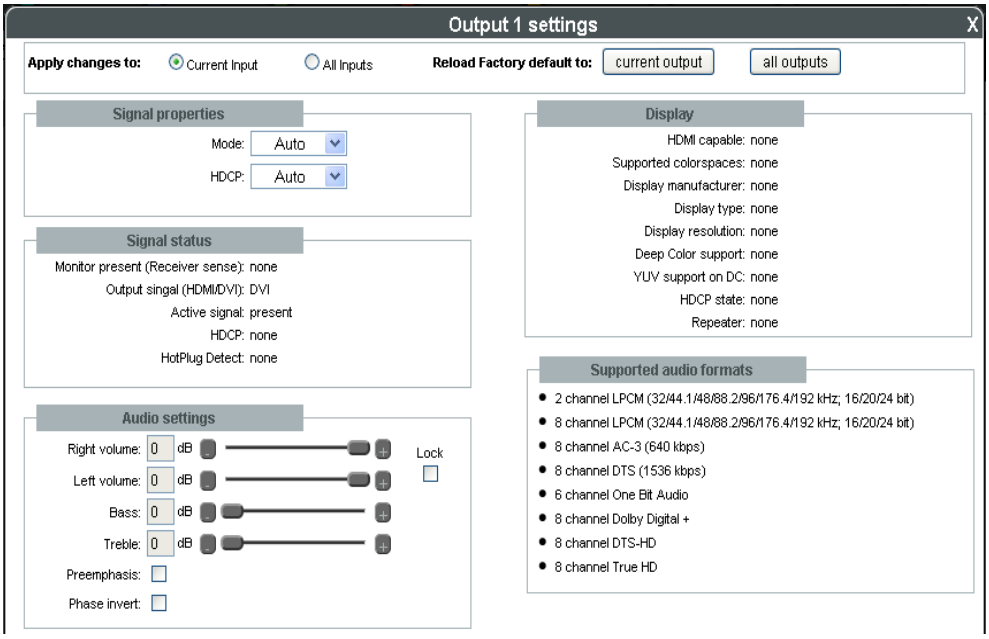


Figure 6-3. Input settings for analog signal

6.3.10. Output parameter settings

By clicking on an output label a dialog window appears showing the parameters for the corresponding output.



Scope of changes

There are two options to apply changes. To set the scope of the changed settings, select the desired option in the top left box.

Apply changes to current output: this option means the modified parameters are applied only to the currently selected port.

Apply changes to all outputs: this option means that the modified parameters are applied to all output ports.

Info: *When opening this window again, the scope selection will be set to "Current Output" regardless of the active selection at the time of closing. It is to avoid making changes to all outputs by mistake.*

Reload factory defaults

Current output: Reloads the default values to the currently selected output.

All outputs: Loads the factory default values to all outputs.

Output properties

Mode

The 'Mode' can be set to Auto, DVI, HDMI 24bit, HDMI 30bit or HDMI 36bit. The 'Auto' option sets the signal mode regarding to the attached display device's EDID and the incoming signal.

HDCP

The 'HDCP' option sets the HDCP encryption on the output. The Auto setting applies encryption when the incoming signal is encrypted. The Always setting forces encryption on any video signal.

Signal status

Information about the signal and the connection status is shown here.

Analog audio settings

The volume, balance, treble and bass adjustment can be set up regarding the analog stereo output.

Display

Information retrieved from the connected display's EDID is shown.

Supported audio formats

The connected display's supported audio formats are shown based on the read EDID.

6.4. EDID menu

By clicking on the EDID MANAGEMENT menu, the EDID Router page appears.

When the user enters the menu first, the whole EDID list is being downloaded from the matrix. It may take up to 40 seconds for the first time. After the list is downloaded, the current status of the router's EDID is shown in the three boxes.

The **Emulated EDIDs** box contains the resolutions and the vendor names of the EDID reported to the source for each input separately. Emulated EDIDs are also called Input 1 .. Input 4 in the EDID lists.

The **Last attached Monitor's EDIDs** box contains the resolutions and vendor names of the display devices connected to matrix switcher's output. Last attached Monitor's EDIDs are also called Monitor 1 .. Monitor 4.

The **EDID list** box contains all the available EDIDs stored in the matrix memory.

Info: *The upper two segments only show the actual EDID lists. Changes can be made only in the lower list which contains all the lists including Emulated EDIDs and Last Attached Monitors EDIDs.*

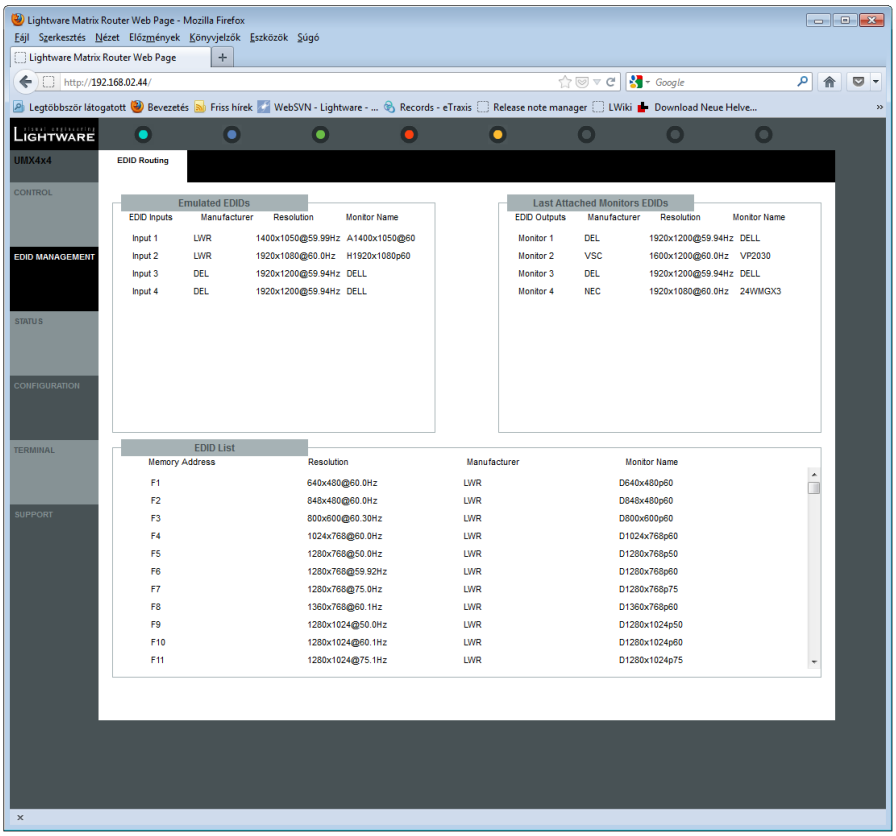


Figure 6-4. EDID lists

6.4.1. Change emulated EDID at one or all inputs

All EDIDs are enumerated in the **EDID list** window.

Step 1. Select the desired EDID from this list with a left mouse click, a popup menu appears.

Step 2. Click the “Switch this EDID to” item. A popup menu appears with an input name list.

Step 3. Click on the desired input, or on the ALL text. Now the EDID has been changed on selected input as the message box shows on the left corner.

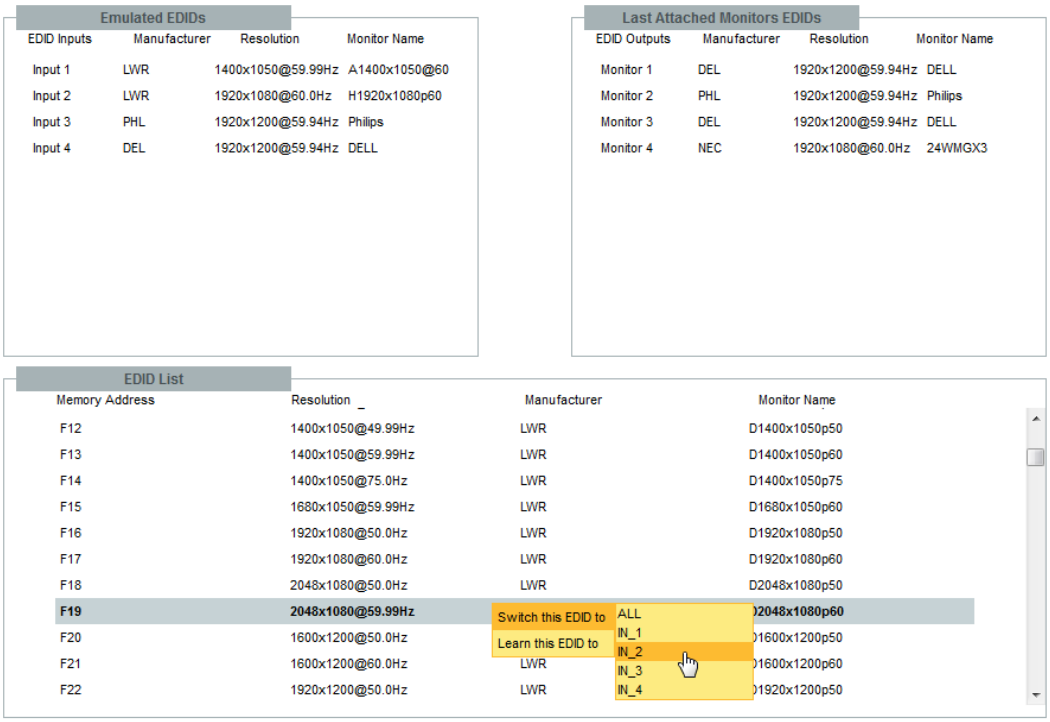


Figure 6-5. Static EDID routing

Info: *Switching an EDID to ALL inputs may take several seconds.*

Switching an EDID from Monitor 1 .. Monitor 4 (called as Last Attached Monitors EDIDs) to an input results dynamic EDID routing. This means that the emulated EDID changes automatically, if a new monitor is attached to the output, by simply copying the data from the monitor.

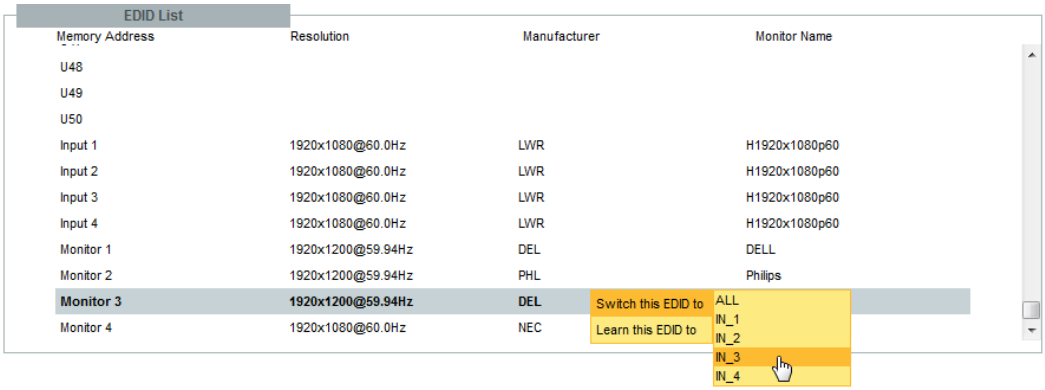


Figure 6-6. Dynamic EDID routing

6.4.2. Learn EDID from attached display device

The matrix switcher can learn the EDID from a connected display device and store it in one of the user programmable memory locations. All the monitor's EDIDs are listed in the **EDID list** window, and also in the **Last Attached Monitors EDIDs** window. Changes can be made only in the **EDID list** window.

Step 1. Click the desired monitor's EDID from the list.

Step 2. Click the Learn this EDID to submenu item. A popup window will show the memory locations from 90 to 139, which are available for the user.

Step 3. Click on the desired memory location. The lists are refreshed in a few seconds, and a message box indicates the change.

Step 4. If the EDID learning was successful a reply message will be appeared on the lower left corner.

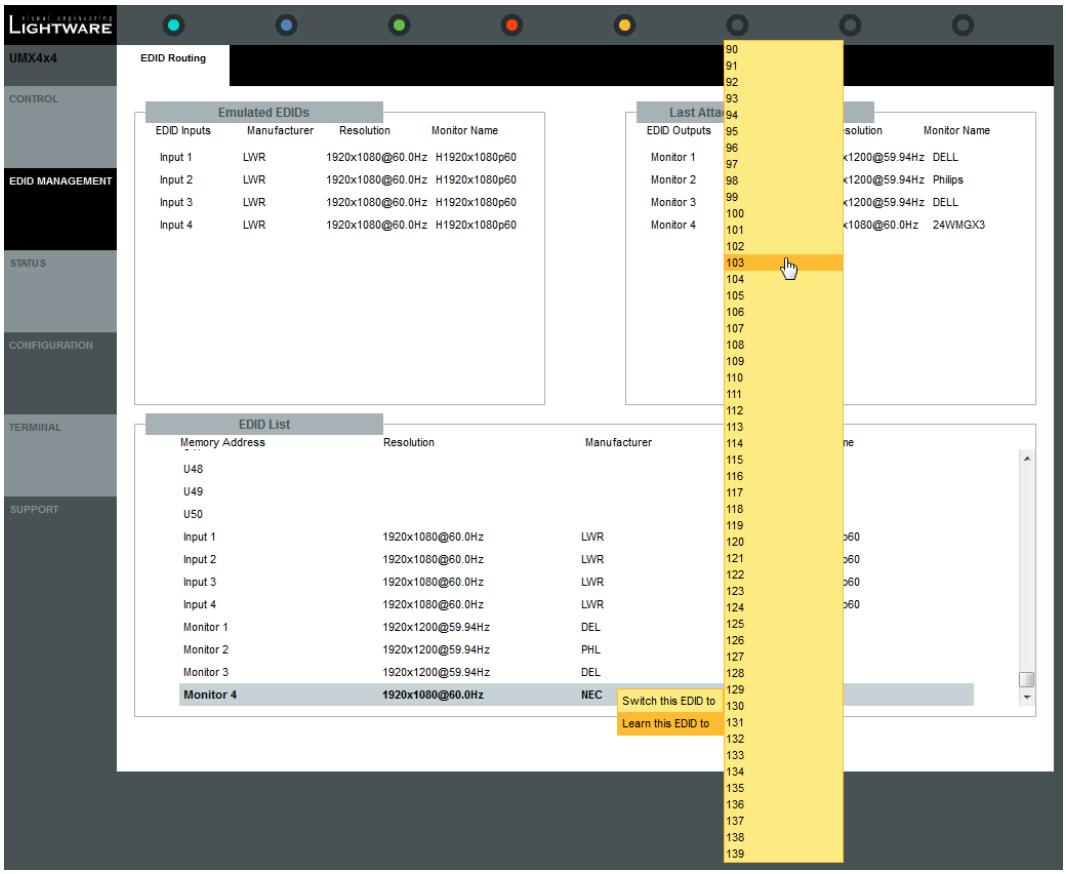
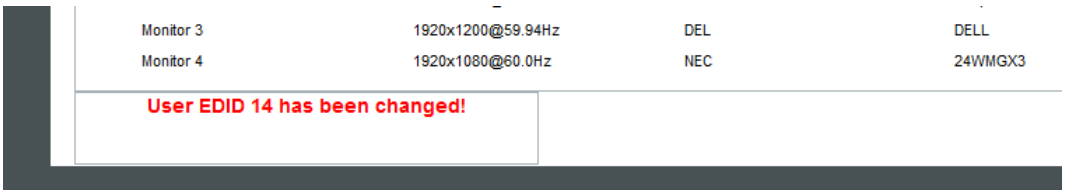


Figure 6-7. Learning EDID from display device



6.5. Status menu

Basic device information, such as the installed cards‟ firmware and hardware revisions are displayed in this window.

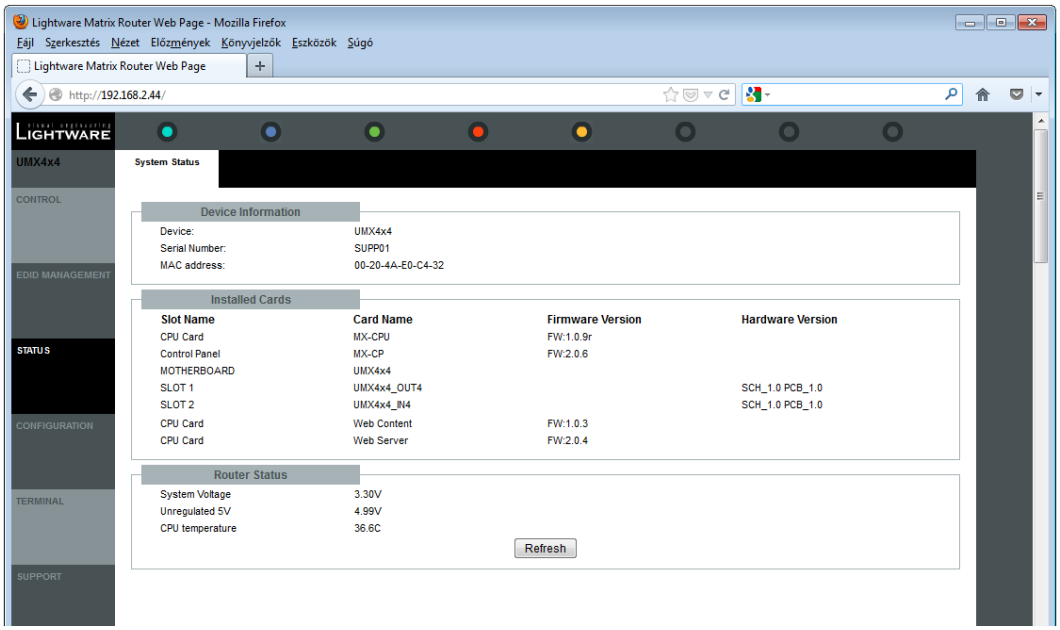
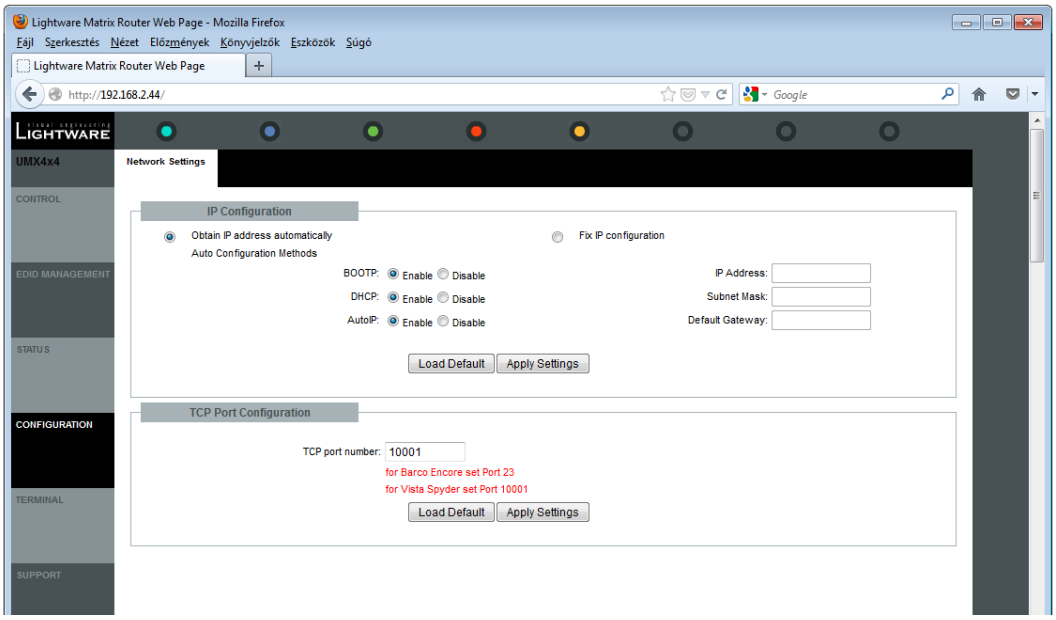


Figure 6-8. Status menu

6.6. Configuration



The unit's network values are displayed when you select Configuration menu.

Info: *It is possible to reload factory default IP setup using the front panel buttons. See section 4.5.4 on page 42 for details.*

6.6.1. Automatic IP Address Configuration

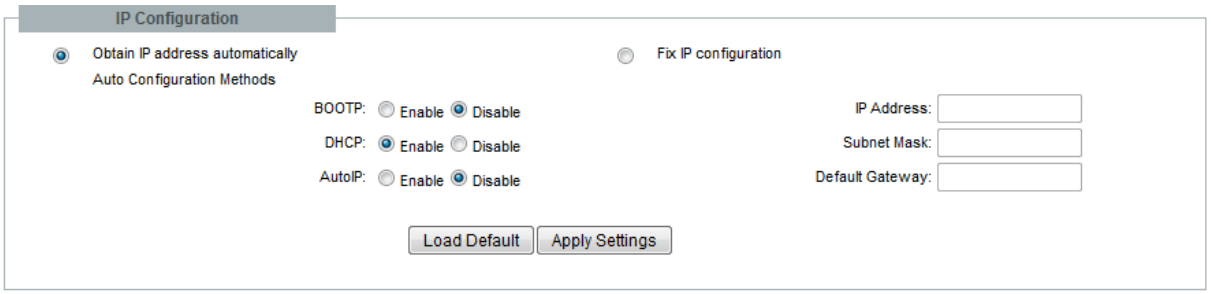
The matrix switcher supports three of the most used automatic IP configuration protocols.

To assign IP address automatically:

Step 1. Click on Configuration menu.

Step 2. Select Obtain IP address automatically.

Step 3. Enter the following (as necessary):



BOOTP Select **Enable** to permit the Bootstrap Protocol (BOOTP) server to assign the IP address from a pool of addresses automatically.

DHCP Select **Enable** to permit the Dynamic Host Configuration Protocol (DHCP) server to assign leased IP address to the matrix unit automatically.

AutoIP Select Enable to permit the matrix to generate an IP in the 169.254.x.x address range with Class B subnet.

Info: *Disabling BOOTP, DHCP, and AutoIP (all three checkboxes) is not advised as the only available IP assignment method will then be ARP or serial port.*

Step 4. When you are finished, click Apply Settings button.

Info: *To continue using the built-in website, you must type in the IP address in your browser.*

6.6.2. Static IP address configuration

The user can manually assign an IP address to the unit, and enter related network settings.

To assign an IP address manually:

Step 1. Click on Configuration menu.

Step 2. Select Fix IP Configuration.

Step 3. Enter the following (as necessary):

IP Address If DHCP is not used to assign IP addresses, enter it manually in decimal-dot notation. The IP addresses must be set to a unique value in the network.

Subnet Mask A subnet mask defines the number of bits taken from the IP address that are assigned for the host part.

Default Gateway The gateway address, or router, allows communication to another LAN segments. The gateway address should be the IP address of the router connected to the same LAN segment as the matrix. The gateway address must be within the local network.

Step 4. When you are finished, click Apply Settings button.

Info: *To continue using the built-in website, you must type in the IP address in your browser.*

6.6.3. Loading the default IP settings

Step 1. Click on the Load Default button. Now the factory default IP address, Subnet Mask and Gateway address is loaded into the input boxes. But they are not saved.

Step 2. To save the settings, click on Apply Settings button.

Step 3. The default fix IP settings are applied:

IP Address:	192.168.254.254
Subnet Mask:	255.255.0.0
Default Gateway:	0.0.0.0

6.6.4. TCP Port Configuration

The user can configure the TCP port number, which is used to communicate with the matrix router through LAN. The input box initially contains the current setting.

Step 1. Type the desired TCP port number into the input box

Step 2. Press the Apply Settings button. The new port will be active after the next connection.

6.6.5. Loading the default TCP Port settings

Step 1. Click on Load Default button. Now the factory default value is in the input box, but it is not saved.

Step 2. To save, click on Apply Settings button. The new port will be active after the next connection.

6.7. Support

For technical support, please don't hesitate to contact Lightware Visual Engineering at *support@lightware.eu*.

6.8. Terminal

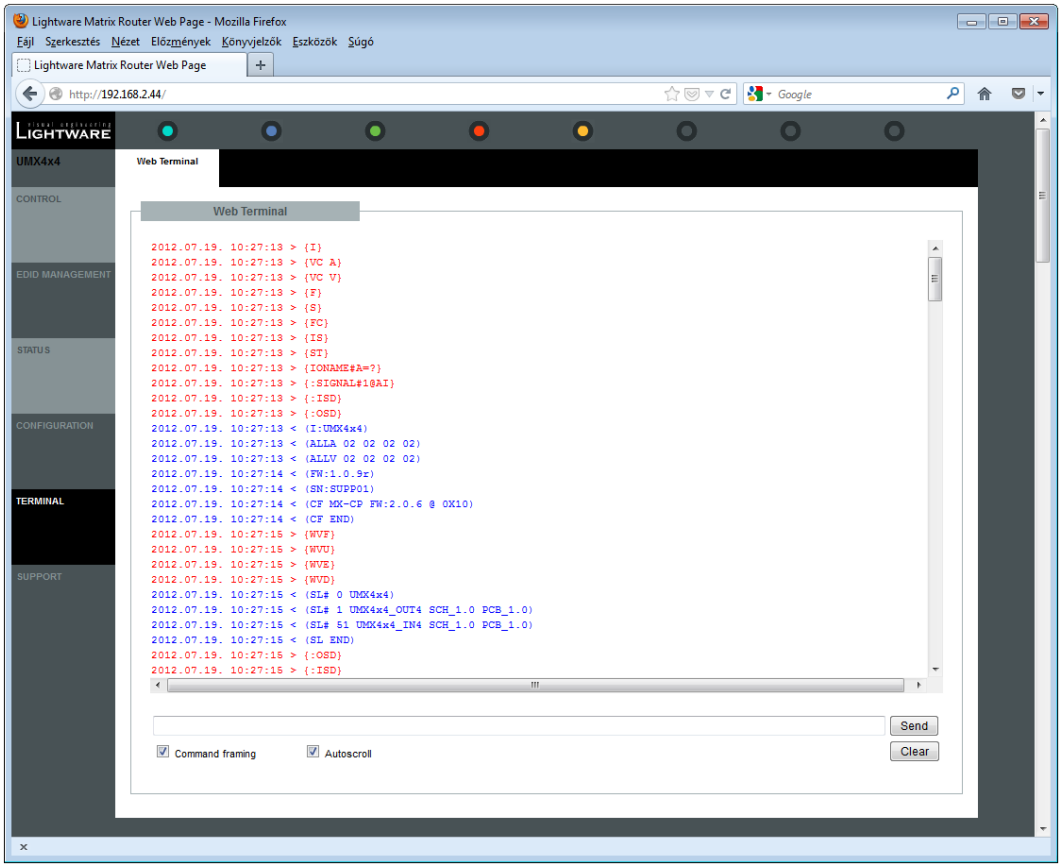


Figure 6-9. Web terminal window

This general-purpose web terminal is intended mainly for test and debugs purposes. After a successful connection is established with a router this terminal can be used. All commands can be used here that are discussed in programmers reference, chapter 7, on page 80. The text can be typed directly into the textbox.

By default commands are automatically surrounded by framing brackets. Every sent command and every received response gets an arrow (-> or <-) prefix, and has different font colors in order to help distinguishing.

If the "Command framing" checkbox is unchecked, you can send multiple commands together, however in this case you have to type in the framing brackets manually.

If the Autoscroll checkbox is unchecked user should use the scroll bar to see the last commands.

7. Programmers reference

Users can connect to the matrix through Ethernet or serial port. After establishing connection, there is no difference between connection types (except some rare cases, which are uniquely noted).

Lightware matrix routers can be controlled with external devices which can communicate according to the router protocol. Lightware routers have a special protocol, but to interoperate with third party devices, a secondary protocol is also provided.

Please see section 4.5 on page 41 about remote operation and connection setup.

7.1. Changing protocols

The router is equipped with multiple router protocols.

The currently used protocol can be viewed or changed any time on the matrix front panel (see *4.5.5*) or with protocol commands.

7.2. Protocol description

The protocol description hereinafter stands for Lightware protocol.

The matrices accept commands surrounded by curly brackets - { } - and responds with data surrounded by round brackets - ( ) - only if a command was successfully executed. All input commands are converted to uppercase, but respond commands can contain upper and lower case letters as well.

Legend for control commands:

<in>	=	input number in 1 or 2 digit ASCII format (01,5,07,16 etc.)
<out>	=	output number in 1 or 2 digit ASCII format
<in²>	=	input number in 2 digit ASCII format (01, 02, 10, 12 etc.)
<out²>	=	output number in 2 digit ASCII format (01, 02, 10, 12 etc.)
<loc>	=	location number in 1, 2 or 3 digit ASCII format
<id>	=	id number in 1 or 2 digit ASCII format
<id²>	=	id number in 2 digit ASCII format
<*italic*>	=	italic parameters are optional
CrLf	=	Carriage return, Line feed (0x0D, 0x0A)
●	=	space character (0x20)
→	=	each command issued by the controller
←	=	each response received from the router

ASCII table:

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
0	00	[NUL]	*32*	20	[Space]	*64*	40	@	*96*	60	`
1	01	[SOH]	*33*	21	!	*65*	41	A	*97*	61	a
2	02	[STX]	*34*	22	"	*66*	42	B	*98*	62	b
3	03	[ETX]	*35*	23	#	*67*	43	C	*99*	63	c
4	04	[EOT]	*36*	24	$	*68*	44	D	*100*	64	d
5	05	[ENQ]	*37*	25	%	*69*	45	E	*101*	65	e
6	06	[ACK]	*38*	26	&	*70*	46	F	*102*	66	f
7	07	[BEL]	*39*	27	'	*71*	47	G	*103*	67	g
8	08	[BS]	*40*	28	(	*72*	48	H	*104*	68	h
9	09	[TAB]	*41*	29	)	*73*	49	I	*105*	69	i
10	0A	[LF]	*42*	2A	*	*74*	4A	J	*106*	6A	j
11	0B	[VT]	*43*	2B	+	*75*	4B	K	*107*	6B	k
12	0C	[FF]	*44*	2C	,	*76*	4C	L	*108*	6C	l
13	0D	[CR]	*45*	2D	-	*77*	4D	M	*109*	6D	m
14	0E	[SOH]	*46*	2E	.	*78*	4E	N	*110*	6E	n
15	0F	[SI]	*47*	2F	/	*79*	4F	O	*111*	6F	o
16	10	[DLE]	*48*	30	0	*80*	50	P	*112*	70	p
17	11	[DC1]	*49*	31	1	*81*	51	Q	*113*	71	q
18	12	[DC2]	*50*	32	2	*82*	52	R	*114*	72	r
19	13	[DC3]	*51*	33	3	*83*	53	S	*115*	73	s
20	14	[DC4]	*52*	34	4	*84*	54	T	*116*	74	t
21	15	[NAK]	*53*	35	5	*85*	55	U	*117*	75	u
22	16	[SYN]	*54*	36	6	*86*	56	V	*118*	76	v
23	17	[ETB]	*55*	37	7	*87*	57	W	*119*	77	w
24	18	[CAN]	*56*	38	8	*88*	58	X	*120*	78	x
25	19	[EM]	*57*	39	9	*89*	59	Y	*121*	79	y
26	1A	[SUB]	*58*	3A	:	*90*	5A	Z	*122*	7A	z
27	1B	[ESC]	*59*	3B	;	*91*	5B	[	*123*	7B	{
28	1C	[FS]	*60*	3C	<	*92*	5C	\	*124*	7C	|
29	1D	[GS]	*61*	3D	=	*93*	5D	]	*125*	7D	}
30	1E	[RS]	*62*	3E	>	*94*	5E	^	*126*	7E	~
31	1F	[US]	*63*	3F	?	*95*	5F	_	*127*	7F	[DEL]

The most frequently used characters are highlighted.

7.3. Storage settings

The matrix stores many configuration settings and parameters and uses different memories. In some cases it is important to know which setting or parameter will or will not change after a firmware upgrade.

Setting or parameter	After firmware upgrade
Matrix router serial number	remain unchanged
HDCP options	remain unchanged
I/O port and preset names	remain unchanged
EDID lists (F, U, D)	remain unchanged
EDID emulation table (E)	remain unchanged
Input port settings	remain unchanged
Output port settings	remain unchanged
Crosspoint settings	remain unchanged
Crosspoint presets	remain unchanged
Serial port settings	remain unchanged
IP settings	remain unchanged
Analog video timings	remain unchanged
Protocol modes	remain unchanged
Remote alert send levels	remain unchanged
Basic error list	cleared on reboot

7.4. Status and identification commands

7.4.1. View product type

Description: Identification of the device. Type 'i' or 'I' then the router responds its name.

Format	Example
Command {I} Response (<PRODUCT_TYPE>)CrLf	→ {i} ← (I:UMX4x4)CrLf

Legend: <PRODUCT_TYPE> shows the router model.

Explanation: The connected device is a UMX4x4-Pro.

7.4.2. View serial number

Description: The router responds its 8-digit serial number.

Format	Example
Command {S} Response (<SERIAL_NUMBER>)CrLf	→ {s} ← (SN:10170142)CrLf

Legend: < SERIAL_NUMBER > shows the serial number of the router.

Explanation: The connected device's serial number is 10170142.

Info: *Only the last 4 numbers are written onto the back of the router*

7.4.3. View Firmware version of the CPU

Description: View the CPU firmware revision.

Format	Example
Command {F} Response (<FW_VERSION>)CrLf	→ {f} ← (FW:1.2.1v)CrLf

Legend: <FW_VERSION> is the firmware version. It is followed by <s> string which may indicate special versions. <s>=v indicates standard version.

Explanation: The connected device's firmware version is 1.2.1v.

7.4.4. View CPU firmware compile time

Description: Shows the CPU firmware compile time.

Format		Example
Command	{CT}	→ {ct}
Response	(Compiled:<DATE>●<TIME>● Build:<tag>)CrLf	← (Compiled:May 10 2012 16:36:35 Build:3564)CrLf

Legend: <DATE> Month, Day and Year

<TIME> Hours, minutes and seconds

<tag> Identification number of the firmware

Explanation: The firmware was made in 10.04.2012, 16:36:35 and the identification number of the firmware is 3564.

7.4.5. View installed controllers' firmware

Description: Shows the firmware revisions of the installed controllers.

Format		Example
Command	{FC}	→ {fc}
Response	(CF●<TYPE>●<*VER*>● @●<*INFO*>)CrLf (CF●END)CrLf	← (CF MX-CP FW:2.0.6 @ *0X10*)CrLf ← (CF END)CrLf

Legend: <TYPE> Installed controller's type

<VER> The controller's firmware version

<*INFO*> Optional information about controller configuration

Explanation: The installed matrix controller firmware is 2.0.6 and has the '0X10' configuration ID.

7.4.6. View current control protocol

Description: Shows the RS-232, TCP/IP control protocol.

Format		Example
Command	{P_?}	→ {p_?}
Response	(CURRENT●PROTOCOL● =●#<x>)CrLf	← (CURRENT PROTOCOL = #1)CrLf

Legend: <x> stands for the active protocol.

Explanation: Protocol 1 is active here.

7.4.7. Set current control protocol

Description: Sets the RS-232 and TCP/IP control protocol (Default is '1').

Format		Example
Command	{P_x}	→ {p_1}
Response	(PROTOCOL●#<x>● SELECTED!)CrLf	← (PROTOCOL #1 SELECTED!)CrLf

Legend: Please read section 7.4.6.

Explanation: Protocol 1 is activated.

7.4.8. View LAN versions

Description: Shows information about the LAN interface.

Format		Example
Command	{LAN_VER=?}	→ {lan_ver=?}
Response	(MAC_ADDR=<mac>)CrLf	← (MAC_ADDR=00-20-4A-E0-C4-32)CrLf
	(WEB_VER=<ver1>)CrLf	← (WEB_VER=1.0.3)CrLf
	(SERVER_VER=<ver2>)CrLf	← (SERVER_VER=2.0.4)CrLf

Legend: <mac> stands for the active protocol.

<ver1> Version of built-in website user interface (webcontent).

<ver2> Version of LAN controller firmware (webserver).

Explanation: MAC address, webcontent and webserver versions are shown.

7.4.9. View router's health

Description: Queries health status. Response varies depending on the frame type.

Format		Example
Command	{ST}	→ {st}
Response	(ST●<*DESC*>)CrLf	← (ST 3.3V *5.00V 29.8C)*CrLf

Legend: <DESC> INNER VOLTAGE 1 (nominal: 3.3V)

INNER VOLTAGE 2 (nominal 5V)

INNER TEMPERATURE

Explanation: Internal voltages and temperature shown.

7.4.10. View installed I/O boards

Description: Shows the hardware name and revision of the installed cards. The number of responses varies regarding the frame size (number of slots).

Format		Example
Command	{IS}	→ {is}
Response	(SL#●*0*●<*MB_DESC*>)CrLf	← (SL# *0 UMX4x4*)CrLf
	(SL#●*1*●<*OB_DESC*>)CrLf	← (SL# *1 UMX4x4_OUT4 SCH_1.0 PCB_1.0*)CrLf
	(SL#●*51*●<*IB_DESC*>)CrLf	← (SL# *51 UMX4x4_IN4 SCH_1.0 PCB_1.0*)CrLf
	(SL●*END*)CrLf	← (SL *END*)CrLf

Legend: Slot 0 represents the motherboard. Slots from 1 to 50 are showing the output boards. Slots from 51 to 100 are showing the input boards.

Legend	Explanation
SL# 0…	This "slot" represents the motherboard.
SL# 1-50...	Slots from 1 to 50 are showing the output boards.
SL# 50-100…	Slots from 51 to 100 are showing the input boards.
SL END	This message indicates the end of the list.

Explanation: The router reports that it has one output and one input slot. There is one input card and one output card installed.

7.4.11. View error list

Description: Shows the basic error list since last boot up.

Format	Example
Command {ELIST=?} Response (ELIST#<num>●<*elevel*>●<*code*>●<*param*>●<*occ*>)CrLf … (ELIST#<num>●<*elevel*>●<*code*>●<*param*>●<*occ*>)CrLf	→ {elist=?} ← (ELIST#1 Notice BOOT p:0x03 o:1)CrLf … ← *(ELIST#2 Notice READY p:0x00 o:1)*CrLf

Legend:

<num>:	line number	
<elevel>:	NOTICE =	Not an error. Initialization information.
	WARNING =	Possible problem without influencing normal operation.
	MATTER =	Problem that may lead to further errors.
	ERROR =	Serious error. Must report to support.
	FATAL =	Fatal error. Normal operation is not possible.
<code>:	short name for type of log entry	
<param>:	technical parameter	
<occ>:	occurrence number for this type of log entry	

Explanation: There are no errors only standard notices that occur on boot up.

Info: *The error list can contain NOTICEs and WARNINGs under normal operation. These entries do not mean that there is any problem with the matrix!*

7.5. System commands

7.5.1. Reload factory defaults

Description: Factory default settings can be reloaded for different functions separately. Multiple functions can be entered.

Format	Example
Command {FACTORY=<f1>;<f2>;…;<fx>} Response (FACTORY●<f1>…)CrLf … (FACTORY●<fx>…)CrLf	→ {factory=xpoint;iocards;edids} ← (FACTORY XPOINT…)CrLf ← (FACTORY IOCARDS…)CrLf ← (FACTORY EDIDS…)CrLf

Legend: *<f1>, <f2>* are the names of the functions which have to be reset to factory default. Any number of <fx> can be entered, separated by semicolons.

<fx>	Restores factory settings to	Additional response
XPOINT	Crosspoint table and configuration (All outputs to in1, unmute, unlock)	none
IONAMES	Input and output names	(INAME#1=Input1) (ONAME#1=Output1)
PRESETS	Crosspoint presets (All output to in1, unmuted), and preset names	(PNAME#1=Preset1) (I1 ALL) (SPR01)…(SPR32)
IOCARDS	All I/O settings for boards currently in the frame	none
EDIDS	Emulated EDIDs (F49 is default)	none
EDIDMEM	Clear User and Dynamic EDIDs	(DE_OK)
ALL	Restores all of the factory settings listed above	as above

Explanation: Factory default settings reloaded for crosspoint and I/O card configurations and emulated EDIDs.

Info: *The response may contain additional messages as the router makes the configurations. These responses can be omitted.*

Info: *After resetting the needed parameters, the matrix restarts.*

7.5.2. Count HDCP keys

Description: If there is an HDCP source on any input of the matrix, the matrix can ask the source whether it can handle <num> piece of sink devices.

Format		Example
Command	{:HDCPTEST<in>@<num>}	→ {:hdcptest2@8}
Response	(HDCPTEST=SUCCESS)CrLf	← (HDCPTEST=SUCCESS)CrLf

Legend: *<in>* input port where the key counting will be executed

<num> the number of the HDCP keys

Explanation: The source on the 2nd input can handle 8 HDCP sink devices.

7.5.3. Clear HDCP key cache

Description: The matrix stores the HDCP keys from the connected devices. These cached keys can be cleared with this command.

Format		Example
Command	{:HDCPRESET}	→ {:hdcpreset}
Response	(Done)CrLf	← (Done)CrLf

Explanation: HDCP key cache is cleared.

Info: *This function is useful when too many keys were cached and a connected source device cannot accept so many keys.*

7.5.4. Restart matrix router

Description: The matrix router can be restarted without unplugging power.

Format		Example
Command	{RST}	→ {rst}
Response	(Booting…)CrLf	← (Booting…)CrLf
	(<name>●Ready!)CrLf	← (UMX4x4 Ready!)

Legend: *<name>* is the type of the matrix

Explanation: The matrix reboots and sends a message when it is ready.

Info: *The response can be seen only if the connection to the router is still alive.*

7.6. Communication setup commands

7.6.1. Query IP settings

Description: IP settings can be retrieved from the router with this command.

Format		Example
Command	{IP_CONFIG=?}	→ {ip_config=?}
Response	(IP_CONFIG=<id> ●<ip_address>●<port> ●<mask>●<gateway>)CrLf	← (IP_CONFIG=0 192.168.2.106 10001 255.255.000.000 192.168.002.001) CrLf

Legend:

Identifier	Description		Default value
<id>	0: fix IP	2: DHCP	0
<ip_address>	IP address		192.168.254.254
<port>	TCP/IP port		10001
<mask>	subnet mask		255.255.0.0
<gateway>	gateway address		0.0.0.0

Explanation: The router has a fix IP address 192.168.2.106 on the 255.255.0.0 subnet with a gateway on 192.168.2.1 and communicates over TCP port 10001.

7.6.2. Reload factory default IP settings

Description: This command sets the router to the factory default IP setup.

Format		Example
Command	{IP_CONFIG=!}	→ {ip_config=!}
Response	(Changing●IP● configuration…)CrLf	← (Changing IP configuration…)CrLf
	(DONE!)CrLf or (FAILED!)CrLf	← (DONE!)CrLf

Parameters after successful command execution:

Parameter	Value
IP address	192.168.254.254
port number	10001
Subnet mask	255.255.0.0
Gateway	0.0.0.0

Info: *This command can be used on all control interfaces (LAN, RS-232 and USB) but the '(DONE!)' response cannot be seen on LAN because the connection is dropped just after the '(Changing IP configuration…)' response.*

Info: *Factory default setting can be reloaded by the front panel buttons or on the front panel LCD menu as well.*

7.6.3. Enable DHCP IP setting

Description: After sending this command the router will inquire IP address with DHCP.

Format		Example
Command	{IP_CONFIG=D}	→ {ip_config=d}
Response	(Changing●IP● configuration…)CrLf	← (Changing IP configuration…)CrLf
	(DONE!)CrLf or (FAILED!)CrLf	← (DONE!)CrLf

Parameters after successful command execution:

Parameter	Value
IP address	Acquired with DHCP
port number	unchanged
Subnet mask	Acquired with DHCP
Gateway	Acquired with DHCP

Info: *This command can be used on all control interfaces (LAN, RS-232 and USB) but the '(DONE!)' response cannot be seen on LAN because the connection is dropped just after the '(Changing IP configuration…)' response.*

Info: *DHCP setting can be reloaded by the front panel buttons as well (section* ***Error! eference source not found.****) or on the front panel LCD menu as well.*

7.7. EDID router commands

The EDID router manipulates the EDID memory, which has memory locations that are assigned to specific input or output ports. Please read section 4.3. on page 30 about EDID memory structure.

7.7.1. Change EDID on input

Description: Copy EDID from memory location <loc2> to input port <loc1>.

Format		Example
Command	{<loc1>:<loc2>}	→ {e4:f10}
Response	(E_SW_OK)CrLf	← (E_SW_OK)CrLf
	…delay…	…delay…
	(E_S_C)CrLf	← (E_S_C) CrLf

Legend: <loc1> has to be 'Exx'.

<loc2> can be 'Fxx' or 'Uxx' or 'Dxx'.

Explanation: Factory EDID F10 is copied to input 4.

Info: *If <loc2> is 'Fxx' or 'Uxx' then static EDID routing occurs. In this case the router will keep the same EDID on the input until it is changed with another command.*

Info: *If <loc2> is 'Dxx' then dynamic EDID routing occurs. In this case the router will follow the EDID changes on the output. Every time a different EDID is recognized on the output, it is copied instantly to the input.*

Info: *The router sends (E_S_C) only if the new EDID is different from the earlier one.*

7.7.2. Change EDID on all inputs

Description: Copy EDID from memory location <loc2> to all inputs. Location <loc2> should be 'Fxx' or 'Uxx' for static routing and 'Dxx' for dynamic routing.

Format		Example
Command	{EA:<loc2>}	→ {ea:u2}
Response	(E_SW_OK)CrLf	← (E_SW_OK)CrLf
	…delay…	…delay…
	(E_S_C) CrLf	← (E_S_C) CrLf

Legend: <loc2> can be 'Fxx' or 'Uxx' or 'Dxx'.

Explanation: User EDID U2 is copied to all inputs.

Info: *This operation can take several seconds.*

7.7.3. Save EDID to user memory (Learn EDID)

Description: Learn EDID from <loc2> to <loc1>.

Format		Example
Command	{<loc1>:<loc2>}	→ {u4:d3}
Response	(E_SW_OK)CrLf	← (E_SW_OK)CrLf
	(E_S_C) CrLf	← (E_S_C) CrLf

Legend: <loc1> must be 'Uxx'.

Explanation: EDID from output 3 is saved to user EDID #4.

7.7.4. View emulated EDIDs on all inputs

Description: Shows the currently emulated EDIDs for each input. The value at the given index (<in1>..<in4>) shows which EDID is used on that particular input.

Format		Example
Command	{VEDID}	→ {vedid}
Response	(VEDID●<in1>●<in2>●<in3>●<in4>)CrLf	← (VEDID F049 D001 F029 U007)CrLf

Legend: All <inx> indexes show a <loc> which was copied to that input port.

Explanation: F049 (Factory preset EDID F49) is emulated on the input 1. EDID from output 1 is dynamically emulated on input 2. F029 (Factory preset EDID F29) is emulated on the input 3. U007 (User saved EDID U7) is emulated on input 4.

7.7.5. Watch EDID validity table

Description: Shows EDID validity table, which contains information about the EDID memory states.

Format		Example
Command	{WV<type>}	→ {wv*}
Response	(EV<type>●<VALIDITY_TABLE>)CrLf	← (EVU 1100000000000000000000000000000000000000000000000000)CrLf ← (EVD 1000)CrLf ← (EVE 1113)CrLf

Legend:

<type>	<name>	Response length
F	Factory preset EDIDs	100
U	User saved EDIDs	50
D	Dynamic EDIDs	4
E	Emulated EDIDs	4
*	All 'U', 'D' and 'E' EDIDs	

Each number represents the EDID validity state for the corresponding memory location.

Value	Description
'0'	invalid EDID
'1'	valid EDID
'2'	deleted EDID
'3'	changed EDID

Explanation: There is one '3' in the last row on the 4th position. This means that the emulated EDID on input 4 is changed since the last EDID query on that port.

Info: *If a changed EDID is queried by the {WH} command (see the next section), its value returns to '1'. The status of a deleted EDID returns to '0' after query.*

7.7.6. View EDID header

Description: Shows basic information about EDIDs in the memory.

Format	Example
Command {WH<loc>} Response (EH#<loc>● <EDID_HEADER>)CrLf	→ {whe1} ← (EH#E1 NEC 1280x1024@60 LCD1970NXp)CrLf

Legend: Depending on <loc> the query can be for one EDID, all EDID in the block.

<loc>	Result	Response
Fxx	Factory EDID query	header for one EDID
Uxx	User EDID query	
Dxx	Dynamic EDID query	
Exx	Emulated EDID query	
F*	All Factory preset EDIDs	headers for all Factory EDIDs
U*	All User saved EDIDs	headers for 50 user EDIDs
D*	All Dynamic EDIDs	headers from all outputs
E*	All Emulated EDIDs	headers from all inputs

<EDID_HEADER> consists of 3 fields separated by spaces:

PNPID code The three letter abbreviation of the manufacturer

Preferred resolution The resolution and refresh rate stored in the preferred detailed timing block.

Name The name of display device stored in product descriptor.

Explanation: Shows the EDID from the input 1.

7.7.7. Download EDID content from the router

Description: EDID hex bytes can be read directly. The router will issue the whole content of the EDID present on memory location <loc> (256 bytes).

Format	Example
Command {WE<loc>} Response (EB#<loc>●<B1> ●<B2>●..●<B256>)CrLf	→ {wef1>} ← (*EB#F1 00 FF FF FF FF FF FF 00 32 F2 00 00 00 .. .. .. 00 92*) CrLf

Legend: <B1> .. <B256> are space separated hex characters represented in ASCII format.

Explanation: Full EDID from memory location 1 is downloaded.

7.7.8. Upload EDID content to the router

Description: EDID hex bytes can be written directly to the user programmable memory locations.

Sequence:

Step 1. Prepare the router to accept EDID bytes to the specified location <loc> with command *{WL#<loc>}*

Step 2. Router responds that it is ready to accept EDID bytes with *(E_L_S)CrLf*

Step 3. Send 1 block of EDID (1 block consist of 8 bytes of hex data represented in ASCII format) with command:
{WB#<num>●<B1>●<B2>●<B3>●<B4>●<B5>●<B6>●<B7>●<B8>}

Step 4. The router acknowledges with response *(EL#<num>)*

Step 5. Repeat steps 3 and 4 to send the remaining 31 blocks of EDID (32 altogether)

Step 6. After the last acknowledge, the router indicates that the EDID status changed by sending *(E_S_C) CrLf*

Format		Example
Command	{WL#<loc>}	→ {wl#u3}
Response	(E_L_S)CrLf	← (E_L_S) CrLf
Command	{WB#1●<B1>●<B2>●<B3> ●<B4>●<B5>●<B6>●<B7> ●<B8>}	→ {wb#1 00 FF FF FF FF FF FF 00}
Response	(EL#<num>)CrLf	← (EL#1)CrLf
Command	{WB#2●<B9>●<B10> ●<B11>●<B12>●<B13> ●<B14>●<B15>●<B16>}	→ {wb#2 38 A3 8E 66 01 01 01 01}
Response	(EL#<num>) CrLf	← (EL#2)CrLf
	⋮	⋮
Command	{WB#32●<B249>●<B250> ●<B251>●<B252>●<B253> ●<B254>●<B255>●<B256>}	→ {wb#32 36 59 42 0A 20 20 00 96}
Response	(EL#<num>) CrLf	← (EL#32)CrLf
Response	(E_S_C) CrLf	← (E_S_C)CrLf

Legend: <num> represents the sequential number of every 8 byte part of EDID. <num> is between 1 and 32. <B1>..<B256> are the bytes of EDID.

Explanation: Full EDID uploaded to memory location U3.

7.7.9. Delete EDID from memory

Description: Clear EDID from memory location <loc>.

Format		Example
Command	{DE<loc>}	→ {deu*}
Response	(DE_OK)CrLf (E_S_C)CrLf	← (DE_OK)CrLf ← (E_S_C)CrLf

Legend: Depending on <loc>, one EDID, or all EDIDs in a block can be cleared.

<loc>	Result
Fxx	Not valid! Factory EDID cannot be deleted. No response.
Uxx	Specified User EDID is deleted.
Dxx	Specified Dynamic EDID is deleted. It will be empty until a new monitor is connected.
Exx	Specified Emulated EDID cleared. By default F49 EDID is copied to it.
F*	Not valid! Factory EDID cannot be deleted. No response.
U*	All User EDIDs are deleted.
D*	All Dynamic EDIDs are deleted. They will be empty until a new monitor is connected.
E*	All Emulated EDIDs are cleared. By default F49 EDID is copied to them.

Explanation: All user EDIDs are cleared from memory.

7.8. Control commands

Description: The following commands with <A/V/AV> option can take effect in multiple layers, according to their parameters. Depending on 'A' or 'V' it can change only the Audio, or only the Video layer; or 'AV' changes both.

Info: *<A/V/AV> option usually can be skipped for legacy purposes.*
In this case using router commands the router changes all (Video & Audio) layers, but using status commands it displays information about only the Video layer.
Please use AV option, when available.

Usually the commands are sent one by one to the router, but this is not a must. Any command can be send to the router in a batch. To do this, just use the same commands (including { } brackets), but put the "*CrLf*" only at the end of the batch.

The below example shows a batch command that resulted group switching:

One by one commands	**Batch commands** (UMX4x4)
→ {02@01}CrLf ← (O01 I02)CrLf	→ {02@01}{04@03}CrLf ← (O01 I02)CrLf ← (O03 I04)CrLf
→ {04@03}CrLf ← (O03 I04)CrLf	

7.8.1. Switch one input to one output

Description: This command switches an output to an input.

Format		**Example**
Command	{<in>@<out>●<*A/V/AV*>}	→ {4@1 av}
Response	(O<out²>●I<in²>●<*A/V/AV*>)CrLf	← (O01 I04 AV)CrLf

Legend: *<A/V/AV>:* Layer select:
A: Audio layer
V: Video layer
AV: Audio&Video layer

Explanation: The example shows how to connect both Audio and Video from input 4 to output 1.

Info: *If the command is used without the* <A/V/AV> parameter, both layers are switched.

7.8.2. Switch one input to all outputs

Description: This command switches all video and/or audio outputs to one input.

Format		**Example**
Command	{<in>@O●<*A/V/AV*>}	→ {3@o av}
Response	(I<in²>●ALL●<*A/V/AV*>)CrLf	← (I03 ALL AV)CrLf

Legend: Please read section 7.8.1. (*Switch one input to one output*)

Explanation: The example shows how to connect all outputs to input 3.

7.8.3. Switch diagonal

Description: This command switches all video and/or audio outputs to the same numbered inputs. Output 1 will be switched to the Input 1, Output 2 to Input 2, etc.

Format		Example
Command	{<in>@D●<*A/V/AV*>}	→ {1@d av}
Response	(ALL*V*●<out²>●<out²>●<out²>●<out²>)CrLf	← (ALLV 01 02 03 04)CrLf
	(ALL*A*●<out²>●<out²>●<out²>●<out²>)CrLf	← (ALLA 01 02 03 04)CrLf

Legend: Please read section 7.8.1. (*Switch one input to one output*)

Explanation: The example shows how to connect audio and video outputs to the same numbered inputs. The response contains all the connections, if both layers are selected the response is two messages.

7.8.4. View connection on output

Description: This command shows the video connection status of an output.

Format		Example
Command	{?<out>}	→ {?2}
Response	(O<out²>●I<in²>)CrLf	← (O02●I03)CrLf

Explanation: The example shows that video output 2 is connected to input 3

Info: *This command kept for legacy purposes; to get information about all layers, please use the multilayer command: 7.8.5. (View connection on all outputs)*

Info: *The response shows connections only for the video layer*.

7.8.5. View connection on all outputs

Description: This command displays all connections on a single or multiple layers.

Format		Example
Command	{VC●<*A/V/AV*>}	→ {vc●av}
Response	*(ALLV●<in²>●<in²>●<in²>●<in²>)CrLf*	← (ALLV●02●02●02●03)CrLf
	*(ALLA●<in²>●<in²>●<in²>●<in²>)*CrLf	(ALLA●02●02●02●04)CrLf

Legend: Please read section 7.8.1. (*Switch one input to one output*)

<in²> Contains mute & lock state of the output:
M = muted
L = locked
U = muted & locked.
and contains the number of the selected input
(02 = connected to input no. 2)
(M02 = muted output, selected input: no. 2)
(L02 = locked to input: no. 2)
(U02 = muted & locked output, selected input: no. 2)

Explanation: The response contains all the connections, if both channels are selected the response is two messages.
The example shows that output 1,2,3 Audio & Video are connected to input 2 A&V; output 4 video is connected to input 3 and output 4 audio is connected to input 4.

(ALLV●M02●U02●L02●03) response means video output 1 is muted, video output 2 is muted & locked and video output 3 is locked to input 2.

Info: *If the command is used without the* <A/V/AV> parameter, the response shows only the video layer connections.

7.8.6. Mute specified output

Description: This command mutes an output on a single or multiple layers.

Format		Example
Command	{#<out>●<*A/V/AV*>}	→ {#2●a}
Response	(1MT<out²>●<*A/V/AV*>)CrLf	← (1MT02●A)CrLf

Legend: Please read section 7.8.1. (*Switch one input to one output*)

Explanation: The example shows how to mute audio output no. 2.

Info: *If the command is used without the* <A/V/AV> parameter, both layers are muted.

7.8.7. Unmute specified output

Description: This command unmutes an output on a single or multiple layers.

Format		Example
Command	{+<out>●<*A/V/AV*>}	→ {+2●a}
Response	(0MT<out²>●<*A/V/AV*>)CrLf	← (0MT02●A)CrLf

Legend: Please read section 7.8.1. (*Switch one input to one output*)

Explanation: The example shows how to unmute audio output no. 2. Now output 2 is switched to the input it was connected to prior to the mute command.

7.8.8. View mutes on all outputs

Description: Viewing all outputs' mute state.

Format		Example
Command	{VM}	→ {vm}
Response	(ALL●<M1>●<M2>●<M3>●<M4>)CrLf	← (ALL 1 0 0 0)CrLf

Legend: All <Mx> indexes are one digit numbers, showing the mute state for the corresponding output. If <Mx> equals 0 the output x is unmuted. If <Mx> equals 1, the output x is muted.

Explanation: Output 1 is muted and the other outputs are not muted.

7.8.9. Lock specified output

Description: This command locks an output on a single or multiple layers.

Format		Example
Command	{#><out>●<*A/V/AV*>}	→ {#>4●av}
Response	(1LO<out²>●<*A/V/AV*>)CrLf	← (1LO04●AV)CrLf

Legend: Please read section 7.8.1. (*Switch one input to one output*)

Explanation: The example shows how to lock audio & video on output no. 4.

7.8.10. Unlock specified output

Description: This command unlocks an output on a single or multiple layers.

Format		Example
Command	{+<<out>●<*A/V/AV*>}	→ {+<4●av}
Response	(0LO<out²>●<*A/V/AV*>)CrLf	← (0LO04●AV)CrLf

Legend: Please read section 7.8.1. (*Switch one input to one output*)

Explanation: The example shows how to unlock audio & video on output no. 4.

7.8.11. Save preset to memory location

Description: Save current crosspoint configuration on one or more layers.

Format		Example
Command	{$<id>●<*A/V/AV*>}	→ {$4 a}
Response	(SPR<id²>●<*A/V/AV*>)CrLf	← (SPR04 A)CrLf

Legend: Please read section 7.8.1. (*Switch one input to one output*)

Explanation: Current audio crosspoint state is saved to preset 4, including the mute state of the outputs. It is possible to save only one layer, in that case the other layer in the preset will be not affected.

Info: *Lock states are not saved. Lock state is assigned to the physical output of the router. Presets don't affect output locks.*

Info: *The maximum preset number is limited to 32 for all routers.*

7.8.12. Load preset from memory location

Description: Load preset <id>.

Format		Example
Command	{%<id>●<*A/V/AV*>}	→ {%4 av}
Response	(LPR<id²>●<*A/V/AV*>)CrLf	← (LPR04 AV)CrLf

Explanation: Current crosspoint state is changed according to preset 4, including the mute state of the outputs. It is possible to load only one layer, in that case other layer crosspoint will be not affected.

7.8.13. View preset

Description: View the <id> numbered preset configuration without switching anything.

Format		Example
Command	{VP#<id>=?}	→ {vp#3=?}
Response	(VP#<id>V●<out²>●<out²>●<out²>●<out²>)CrLf (VP#<id>A●<out²>●<out²>●<out²>●<out²>)CrLf	← (VP#3V 01 02 03 04) ← (VP#3A 01 02 03 04)

Legend: Please read section 7.8.1. (*Switch one input to one output*)

Explanation: Current crosspoint state will not be changed and Preset 3 crosspoint state is shown. If Preset 3 is selected audio and video outputs will be switched to diagonal.

Renaming Presets / Inputs / Outputs

Description: Allows storing names for each preset / input / output. Any 16-byte long string is allowed (16 characters). All characters are converted to uppercase! The router accepts <id> for I/O names depending on the actual frame size. All router models have 32 presets memories.

7.8.14. Rename a preset

Format		Example
Command	{PNAME#<id>=<preset_name>}	→ {pname#1=first preset}
Response	(PNAME#<id>=<preset_name>)CrLf	← (PNAME#1=FIRST PRESET)CrLf

Explanation: Preset 1 was named as "FIRST PRESET".

7.8.15. Rename an input

Format		Example
Command	{INAME#<id>= <input_name>}	→ {iname#3=Media Player}
Response	(INAME#<id>= <input_name>)CrLf	← (INAME#3=MEDIA PLAYER)CrLf

Explanation: Input 3 was named as “MEDIA PLAYER”.

7.8.16. Rename an output

Format		Example
Command	{ONAME#<id>= <output_name>}	→ {ONAME#2=Monitor_no2}
Response	(ONAME#<id>= <output_name>)CrLf	← (ONAME#2=MONITOR_NO2)CrLf

Explanation: Output 2 was named as “MONITOR_NO2”.

Query names of Presets / Inputs / Outputs

Description: Each preset / input / output name can be read from the router.

7.8.17. Read a preset’s name

Format		Example
Command	{PNAME#<id>=?}	→ {pname#1=?}
Response	(PNAME#<id>= <preset_name>)CrLf	← (PNAME#1=FIRST PRESET)CrLf

Explanation: Name for preset 1 is “FIRST PRESET”.

7.8.18. Read an input’s name

Format		Example
Command	{INAME#<in>=?}	→ {iname#3=?}
Response	(INAME#<in>= <input_name>)CrLf	← (INAME#3=MEDIA PLAYER)CrLf

Explanation: Name for input 3 is “MEDIA PLAYER”.

7.8.19. Read an output’s name

Format		Example
Command	{ONAME#<out>=?}	→ {oname#2=?}
Response	(ONAME#<out>=<output_name>)CrLf	← (ONAME#2=MONITOR_NO2)CrLf

Explanation: Name for output 2 is “MONITOR_NO2”.

Set default names of Presets / Inputs / Outputs

Description: Renames **all** preset / input / output names to the default: Preset 1..32 / Input 1..4 / Output 1..4 respectively.

Info: *The <id> field is not relevant here, only has to be a valid one. The command will affect **ALL** Presets / Inputs / Outputs disregarding the actual number that was in the command.*

7.8.20. Reload default preset names

Format		Example
Command	{PNAME#<id>=!}	→ {pname#2=!}
Response	(PNAME#<id>=Preset●<id>)CrLf	← (PNAME#2=Preset 2)CrLf

Explanation: All preset names are set to default: “Preset 1”, “Preset 2”, and so on.

7.8.21. Reload default input names

Format	Example
Command {INAME#<id>=!}	→ {iname#4=!}
Response (INAME#<id>=Input●<id>)CrLf	← (INAME#4=Input 4)CrLf

Explanation: All input names are set to default: "Input 1", "Input 2", and so on.

7.8.22. Reload default output names

Format	Example
Command {ONAME#<id>=!}	→ {oname#3=!}
Response (ONAME#<id>=Output●<id>)CrLf	← (ONAME#3=Output 3)CrLf

Explanation: All output names are set to default: "Output 1", "Output 2", and so on.

7.9. Port status commands

7.9.1. Input port status

Description: Shows the actual status of the input ports.

Format	Example
Command {:ISD}	→ {:isd}
Response (ISD●<INPUT_D>)CrLf	← (ISD 9173)CrLf

Explanation: Input 1 has an analog signal. Input 2 has a connected source but no signal. Input 3 has a digital signal with HDCP encryption. Input 4 has a DVI signal.

Legend: <INPUT_D> contains 4 decimal numbers. Each number represents the state for the corresponding input port.

The binary representation of the responded decimal numbers is shown below.

	3. bit (MSB)	2. bit	1. bit	0. bit (LSB)
UMX4x4-Pro	Analog signal	HDCP active	Digital signal	Source 5V

- Source 5V: The connected source sends 5V
- HDCP active: Incoming signal is encrypted
- Analog signal: Video signal is present on analog input
- Digital signal: Video signal is present on digital input

7.9.2. Output port status

Description: Shows the actual status of the output ports.

Format	Example
Command {:OSD}	→ {:osd}
Response (OSD●<OUTPUT_D>)CrLf	← (OSD 3030)CrLf

Explanation: There are two DVI sinks connected on ports 1 and 3. No other output port is connected.

Legend: <OUTPUT_D> contains 4 decimal numbers. Each number represents the state for the corresponding output port.

The binary representation of the responded decimal numbers is shown below.

	3. bit (MSB)	2. bit	1. bit	0. bit (LSB)
UMX4x4-Pro	0	0	hotplug detect	receiver sense

- Receiver Sense: TMDS termination present in connected device
- Hotplug Detect: Hotplug signal is presented by the connected device

Info: *Both Receiver Sense or Hotplug Detect can be used to determine if there is an attached monitor or other sink device.*

7.9.3. All port status

Description: Shows the actual status of all input and output ports.

Format		Example
Command	{PS}	→ {ps}
Response	(PS●<INPUT_D>, <OUTPUT_D>)CrLf	← (PS 9173,3030)CrLf

Legend: <INPUT_D> and <OUTPUT_D> is the same as for {:ISD} and {:OSD} commands. The input and output state tables are separated with a comma ",". See *7.9.1* and *7.9.2* for detailed legend.

7.10. Input properties

The following commands are setting up the properties of the input ports. If only one or a few parameters have to be modified, the protocol enables to mask the other parameters, so they can stay untouched. To mask a parameter use "x" or "X" as its value.

Example: {:DVII#1@SI=D;x;x;x} Set input port no. 1 to digital
{:ADC#1@SI=x;1;x} Turn on polarity inversion on input port 1.

7.10.1. Set input port properties

Description: This command changes the setup of the input ports.

Format		Example
Command	{:DVII#<in>@<S/A>I= <VIDEO>; <X>; <AUDIO>; <HDCP>}	→ {:dvii#1@si= d; x; h; 0}
Response	(DVII#<in>@<S/A>I= <VIDEO> <X>; <AUDIO>; <HDCP>; <STATUS>; <SOURCE>; *<ATIM1/DCS>;* *<ATIM2/DRES>;* *<ARES/HAUDIO>;* *<HASAMP>* *<HCH>*)CrLf	← (DVII#1@SI= D; A; H; 0; 0; D; 00; 720x480p58;)CrLf

Legend:

<S/A>: **Affected ports:**
S = single selected input
A = all inputs

<VIDEO> **Video source:**
R = Analog RGB (sync embedded or separate HV)
Y= Analog YUV (sync embedded or separate HV)
A = Automatic analog (color space detected by sync)
D = Digital (HDMI / YPbPr)
S = Automatic source selection

<X>: Reserved for compatibility reasons. Don't care.

<AUDIO>: **Audio source:**
0 = No audio,
H = HDMI audio (only with digital interface)
A = Analog input
S = SPDIF input

The following parameters are available above 1.2.2 firmware version

1 Autosense (Priority order: HDMI, SPDIF, Analog)
2 Autosense (Priority order: SPDIF, HDMI)
3 Autosense (Priority order: HDMI, Analog)
4 Autosense (Priority order: SPDIF, Analog)

<HDCP>: **HDCP capability:**
0 = disabled,
1 = enabled.

The following parameters cannot be set, they only appear in response.

<STATUS> **Status** (hexadecimal):
bit 0: (LSB): Power 5V
0 = not detected
1 = detected
bit 1: Source signal HDCP:
0 = not protected
1 = protected
bit 2: Don't care
bit 3: Don't care

<SOURCE> **Actual video source**:
H = HDMI
D = DVI
R = RGBHV (analog signal, separate HV sync)
C = Component signal (analog signal, embedded sync)
- = No video detected.

Above 1.2.2 firmware version the <SOURCE> parameters are two characters. The second one is the active audio source.

0 = No audio
H = Audio from HDMI source
A = Analog audio from analog input
S = Digital audio from SPDIF input

Source dependent parameters:

Analog signal properties are displayed, when <SOURCE> = R / C:

<*ATIM1*> **Analog timing1:**
0 = SMTPE standard
1 = User saved preset
2 = EDID detailed timing
3 = Factory preset
4 = GTF formula
5 = User modified (not saved)

<*ATIM2*> **Analog timing2:** (depending on <ATIM1>)
<ATIM1> = 0 -> SMTPE record number
<ATIM1> = 1 -> User preset number
<ATIM1> = 2 -> Detailed timing number
<ATIM1> = 3 -> Factory preset number
<ATIM1> = 4 -> Fixed zero.

<*ARES*> **Resolution string**. (example: 1600x1200p60)

Digital signal properties are displayed, when <SOURCE> = H / D:

<*DCS*> 2 byte hexadecimal number:
bit 0 = 1: Color depth: 30 bit/pixel (not supported)
bit 1 = 1: Color depth: 36 bit/pixel
bit 2 = 1: Color depth: 48 bit/pixel (not supported)
bit 0&1&2 =0: Color depth: 24 bit/pixel
bit 4: Color space: YCbCr422
bit 5: Color space: YCbCr444

<*DRES*> **Incoming resolution string**. (example: 1600x1200p60)

If HDMI signal present <SOURCE> = H, there are more HDMI specific parameters:

<HAUDIO> **HDMI Audio properties:**
0 = no audio
P = 2 channel stereo (L-PCM)
M = Multichannel-PCM (M-PCM)
S = Compressed audio
H = HBR audio
D = DST audio (not supported)
E = DSD audio (not supported)

<HASAMP> If <HAUDIO> not S or H: HDMI audio sample rate in kHz.
<HAUDIO> = S (Compressed) multiply by 32,
<HAUDIO> = H (HBR) multiply by 4

32	32	kHz
44	44,1	kHz
48	48	kHz
88	88,2	kHz
96	96	kHz
176	176,4	kHz
192	192	kHz

<HCH> Contains CEA-861 compatible channel assignment,
if M-PCM signal present:

0x00	-	-	-	-	-	-	FR	FL
0x01	-	-	-	-	-	LFE	FR	FL
0x02	-	-	-	-	FC	-	FR	FL
0x03	-	-	-	-	FC	LFE	FR	FL
0x04	-	-	-	RC	-	-	FR	FL
0x05	-	-	-	RC	-	LFE	FR	FL
0x06	-	-	-	RC	FC	-	FR	FL
0x07	-	-	-	RC	FC	LFE	FR	FL
0x08	-	-	RR	RL	-	-	FR	FL
0x09	-	-	RR	RL	-	LFE	FR	FL
0x0A	-	-	RR	RL	FC	-	FR	FL
0x0B	-	-	RR	RL	FC	LFE	FR	FL
0x0C	-	RC	RR	RL	-	-	FR	FL
0x0D	-	RC	RR	RL	-	LFE	FR	FL
0x0E	-	RC	RR	RL	FC	-	FR	FL
0x0F	-	RC	RR	RL	FC	LFE	FR	FL
0x10	RRC	RLC	RR	RL	-	-	FR	FL
0x11	RRC	RLC	RR	RL	-	LFE	FR	FL
0x12	RRC	RLC	RR	RL	FC	-	FR	FL
0x13	RRC	RLC	RR	RL	FC	LFE	FR	FL
0x14	FRC	FLC	-	-	-	-	FR	FL
0x15	FRC	FLC	-	-	-	LFE	FR	FL
0x16	FRC	FLC	-	-	FC	-	FR	FL
0x17	FRC	FLC	-	-	FC	LFE	FR	FL
0x18	FRC	FLC	-	RC	-	-	FR	FL
0x19	FRC	FLC	-	RC	-	LFE	FR	FL
0x1A	FRC	FLC	-	RC	FC	-	FR	FL
0x1B	FRC	FLC	-	RC	FC	LFE	FR	FL
0x1C	FRC	FLC	RR	RL	-	-	FR	FL
0x1D	FRC	FLC	RR	RL	-	LFE	FR	FL
0x1E	FRC	FLC	RR	RL	FC	-	FR	FL
0x1F	FRC	FLC	RR	RL	FC	LFE	FR	FL

Where:

FL	Front Left
FC	Front Center
FR	Front Right
FLC	Front Left Center
FRC	Front Right Center
RL	Rear Left
RC	Rear Center
RR	Rear Right
RLC	Rear Left Center
RRC	Rear Right Center
LFE	Subwoofer

7.10.2. Query input port properties

Description: Check status of the input ports.

Format		Example	
Command	{:DVII#<in>@<S/A>I=?}	→	{:dvii#1@si=?}
Response	(DVII#<in>@<S/A>I= <VIDEO>; <X>; <AUDIO>; <HDCP>; <STATUS>; <SOURCE>; *<ATIM1/DCS>;* *<ATIM2/DRES>;* *<ARES/HAUDIO>;* *<HASAMP>;* *<HCH>;*)CrLf	←	(DVII#1@SI= S; A; H; 0; 1; HH; 20; 1920x1080p24; M; 48; 0B;)CrLf

Legend: Please read section 7.10.1. (Set input port properties)

7.10.3. Reset input port properties

Description: This command resets the properties of the input ports.

Format		Example	
Command	{:DVII#<in>@<S/A>I=RESET}	→	{:dvii#1@si=reset}
Response	(DVII#<in>@<S/A>I= <VIDEO>; <X>; <AUDIO>; <HDCP>; <STATUS>; <SOURCE>; *<ATIM1/DCS>;* *<ATIM2/DRES>;* *<ARES/HAUDIO>;* *<HASAMP>;* *<HCH>;*)CrLf	←	(DVII#1@SI= S; A; H; 0; 1; HH; 20; 1920x1080p24; M; 48; 0B;)CrLf

Legend: Please read section 7.10.1. (Set input port properties)

7.10.4. Set analog timing properties

Description: This command changes the setup of the analog timing data.

Format		Example	
Command	{:ANALOG#<in>@<S/A>I=	→	{:analog#4@si=
	<PHS>;		10;
	<FHS>;		800;
	<HS>;		640;
	<VS>;		480;
	<HP>;		75;
	<VP>;}		18;}
Response	(DVII#<in>@<S/A>I=	←	(ANALOG#4@SI=
	<PHS>		0;
	<FHS>;		2640;
	<HS>;		1920;
	<VS>;		1080;
	<HP>;		192;
	<VP>;		41;
	<LCF>;		1124;
	<FORM>;		P;
	<VSP>;		-;
	<HSP>;		-;
	<FPS>;)CrLf		50;)CrLf

Legend:

<S/A>:	**Affected ports:**
	S = single selected input
	A = all inputs
<PHS>	Phase
<FHS>	Full Horizontal Size
<HS>	Horizontal Size
<VS>	Vertical Size
<HP>	Horizontal Position
<VP>	Vertical Position

Info: *The following parameters cannot be set, they only appear in response.*

<LCF>	*Full Vertical Size (Line Count per Field)*
<FORM>	*Format: Progressive or Interlaced*
<VSP>	*Vertical Sync. Polarity*
<HSP>	*Horizontal Sync. Polarity*
<FPS>	Frame Per Sec in Hz

7.10.5. Query analog timing properties

Description: Check analog timing data of the input ports.

Format		Example	
Command	{:ANALOG#<in>@<S/A>I=?}	→	{:analog#3@si=?}
Response	(ANALOG#<in>@<S/A>I=	←	(ANALOG#3@SI=
	<PHS>;		0;
	<FHS>;		2160;
	<HS>;		1600;
	<VS>;		1200;
	<HP>;		455;
	<VP>;		41;
	<LCF>;		1242;
	<FORM>;		P;
	<VSP>;		+;
	<HSP>;		-;
	<FPS>)CrLf		60;)CrLf

Legend: Please read section 7.10.1. (*Set input port properties*)

7.10.6. Reset analog timing properties

Description: This command resets the analog timing properties.

Format		Example	
Command	{:ANALOG#<in>@<S/A>I=RESET}	→	{:analog#1@si=reset}
Response	(ANALOG#<in>@<S/A>I=	←	(ANALOG#1@SI=
	<PHS>;		0;
	<FHS>;		2160;
	<HS>;		1600;
	<VS>;		1200;
	<HP>;		455;
	<VP>;		41;
	<LCF>;		1242;
	<FORM>;		P;
	<VSP>;		+;
	<HSP>;		-;
	<FPS>)CrLf		60;)CrLf

Legend: Please read section *7.10.1*. (*Set input port properties*)

7.10.7. Set analog color properties

Description: Set analog color properties data of the input ports.

Format		Example	
Command	{:PICTURE#<in>@<S/A>I=	→	{:picture#3@si=
	<DF_CHA>;<DF_CHB>;<DF_CHC>;		*1023;1023;1023;*
	<G_CHA>;<G_CHB>;<G_CHC>;		*1023;1023;1023;*
	<O_CHA>;<O_CHB>;<O_CHC>;		*1023;1023;1023;*
	<CONT>;<SAT>;<BRIGHT>;<HUE>;)		*128;128;0;0;)CrLf*
Response	(PICTURE#<in>@<S/A>I=	←	(PICTURE#3@SI=
	<DF_CHA>;<DF_CHB>;<DF_CHC>;		1023;1023;1023;
	<G_CHA>;<G_CHB>;<G_CHC>;		1023;1023;1023;
	<O_CHA>;<O_CHB>;<O_CHC>;		1023;1023;1023;
	<CONT>;<SAT>;<BRIGHT>;<HUE>;)CrLf		128;128;0;0;)CrLf

Legend:

<S/A>:	**Affected ports:**		
	S = single selected input		
	A = all inputs		
<DF_CHA>	**Digital fine-clamp for CH-A:**		0-4096
<DF_CHB>	**Digital fine-clamp for CH-B:**		0-4095
<DF_CHC>	**Digital fine-clamp for CH-C:**		0-4095
<G_CHA>	**Gain for CH-A:**	0-1023	
<G_CHB>	**Gain for CH-B:**	0-1023	
<G_CHC>	**Gain for CH-C:**	0-1023	
<O_CHA>	**Offset for CH-A:**	0-1023	
<O_CHB>	**Offset for CH-B:**	0-1023	
<O_CHC>	**Offset for CH-C:**	0-1023	
<CONT>	**Contrast:**	0-255	
<SAT>	**Saturation:**	0-255	
<BRIGHT>	**Brightness:**	0-255	
<HUE>	**Hue:**	0-127	

Info *Analog color setting will not be saved automatically. User can save it with the next command.*

7.10.8. Save analog color properties

Description: Save analog color properties of the input ports.

Format		Example
Command	{:PICTURE#<in>@<S/A>I=SAVE*)*	→ {:picture#3@si=save*)CrLf*
Response	(P SAVED)*CrLf* (PICTURE#<in>@<S/A>I= *<DF_CHA>;<DF_CHB>;<DF_CHC>;* *<G_CHA>;<G_CHB>;<G_CHC>;* *<O_CHA>;<O_CHB>;<O_CHC>;* *<CONT>;<SAT>;<BRIGHT>;<HUE>;)CrLf*	← (P SAVED)CrLf ← (PICTURE#3@SI= 1023;1023;1023; 1023;1023;1023; 1023;1023;1023; 128;128;0;0;)CrLf

Legend: Please read section 7.10.1. (Set input port properties)

7.10.9. Query analog color properties

Description: Check analog color properties data of the input ports.

Format		Example
Command	{:PICTURE#<in>@<S/A>I=?}	→ {:picture#3@si=?}
Response	(PICTURE#<in>@<S/A>I= *<DF_CHA>;<DF_CHB>;<DF_CHC>;* *<G_CHA>;<G_CHB>;<G_CHC>;* *<O_CHA>;<O_CHB>;<O_CHC>;* *<CONT>;<SAT>;<BRIGHT>;<HUE>;)CrLf*	← (PICTURE#3@SI= 1023;1023;1023; 1023;1023;1023; 1023;1023;1023; 128;128;0;0;)CrLf

Legend: Please read section 7.10.1. (Set input port properties)

7.10.10. Reset analog color properties

Description: Reset analog color properties of the input ports.

Format		Example
Command	{:PICTURE#<in>@<S/A>I=FACTORY}	→ {:picture#3@si=factory}
Response	(P SAVED)*CrLf* (PICTURE#<in>@<S/A>I= *<DF_CHA>;<DF_CHB>;<DF_CHC>;* *<G_CHA>;<G_CHB>;<G_CHC>;* *<O_CHA>;<O_CHB>;<O_CHC>;* *<CONT>;<SAT>;<BRIGHT>;<HUE>;)CrLf*	← (P SAVED)*CrLf* ← (PICTURE#3@SI= 1023;1023;1023; 1023;1023;1023; 1023;1023;1023; 128;128;0;0;)CrLf

Legend: Please read section 7.10.1. (Set input port properties)

7.10.11. Set analog input audio parameters

Description: This command changes the setup of the ADC on the audio board.

Format		Example
Command	{:ADC#<in>@<S/A>I= <GAIN>;<POL>;<DC>}	→ {:adc#1@si=9;1;0}
Response	(ADC#<in>@<S/A>I= <GAIN>;<POL>;<DC>)CrLf	← (ADC#1@SI=9;1;0;)CrLf

Legend:

<S/A>: **Affected ports:**
S = single selected output
A = all outputs

<GAIN>: **Gain** on the input port: 0, 3, 6, 9 .. 21, 24 dB

<POL>: **Polarity inversion:**
0 = Normal (phase=0°),
1= Inverted (phase=180°)

<DC>: **Audio DC filter:**
0 = DC filter off,
1 = DC filter on.

7.10.12. Query analog input audio properties

Description: This command reads the setup of the ADC on the audio board.

Format		Example
Command	{:ADC#<in>@<S/A>I=?}	→ {:adc#1@si=?}
Response	(ADC#<in>@<S/A>I=<GAIN>;<POL>;<DC>)CrLf	← (ADC#1@SI=9;1;0;)CrLf

Legend: Please read section *7.10.1*. (*Set input port properties*)

7.10.13. Set the color of no sync picture

Description: If there is no incoming video signal router gives a monochrome 640x480p60 picture to the output. This command sets the color of the no sync picture with an RGB value.

Format		Example
Command	{:SETBG#<in>@<S/A>I=<RED>;<GREEN>;<BLUE>;}	→ {:setbg#1@si=255;255;0;}
Response	(SETBG#1@SI=<RED>;<GREEN>;<BLUE>;)CrLf	← (SETBG#1@SI=255;255;0;)CrLf

Legend:

<S/A>:	**Affected ports:** S = single selected input A = all outputs
<RED>	Red component of RGB value.
<GREEN>	Green component of RGB value.
<BLUE>	Blue component of RGB value.

Explanation: The example shows how to set yellow colored monochrome no sync picture.

7.10.14. Query the color of no sync picture

Description: This command reads the RGB color code of the no sync picture.

Format		Example
Command	{:SETBG#<in>@<S/A>I=?}	→ {:SETBG#1@SI=?}
Response	(SETBG#1@SI=<RED>;<GREEN>;<BLUE>;)CrLf	← (SETBG#1@SI=255;255;0;)CrLf

Legend: Please read section *7.10.1*. (*Set input port properties*)
Explanation: The no sync picture color is the (255, 255, 0) RGB coded yellow.

7.10.15. Query timings of the incoming signal

Description: This command reads out the properties of the incoming signal on the selected input ports.

Format		Example
Command	{GETTIMINGS#<in>@<S/A>=?}	→ {:GETTIMINGS#1@SI=?}
Response	(GETTIMINGS#<in>@<S/A>= <TLW>; <LW>; <HFP>; <HW>; <HBP>; <TH>; <H>; <VFP>; <VW>; <VBP>; <TMDS>; <BPP>;)CrLf	← (GETTIMINGS#1@SI= 2160; 1600; 105; 0; 455; 1242; 1200; 2; 3; 37; 162134; 24;)CrLf

Legend: <S/A>: **Affected ports:**
S = single selected input
A = all inputs
<TLW>: *Total Line Width*
<LW>: *Line Width*
<HFP>: *Hsync Front Porch*
<HW>: *Hsync Width*
<HBP> *Hsync Back Porch*
<TH> *Total Height*
<H> *Height*
<VFP> *Vsync Front Porch*
<VW> *Vsync Width*
<VBP> *Vsync Back Porch*
<TMDS> *TMDS clock in kHz*
<BPP> *Bit/Pixel*

7.11. Output properties

The following commands are setting up the properties of the output ports. If only one or a few parameters have to be modified, the protocol enables to mask the other parameters, so they can stay untouched. To mask a parameter use “x” or “X” as its value.

Example: {:HDMI#2@SO=H;x;x;x;1;} Set output port no. 2 to HDMI 24 bit.
{:AUDIO#1@SO=x;x;20;x;x;x;} Turn on bass enhancement (20dB)

7.11.1. Set output video properties

Description: This command is for configuring output port settings.

Format		Example
Command	{:HDMI#<out>@<S/A>O=<MODE>;<CSPAC>;<CRANG>;<SUBS>;<HDCP>;}	→ {:HDMI#2@SO=H;x;x;x;1;}
Response	(HDMI#<out>@<S/A>O=**G**<CON><MODE><SIG><HDCP><HPD>;**O**<MODE><CSPAC><CRANG>;<SUBS> <HDCP>)**M**<HSUP><AUTH><REP><YUV4><YUV2><AUD><PCM><DC>CrLf	← (HDMI#2@SO=G0H100;OHAAA1;)CrLf

Legend for command:

<S/A>: **Affected ports:**
S = single-selected output
A = all outputs
<MODE>: **Output signal mode:**
A = Automatic (this setting gives a response as D/H/1/2),
D = DVI,
H = HDMI 24bit,
1 = HDMI 30bit deepcolor,
2 = HDMI 36bit deepcolor.
<CSPAC>: Reserved for legacy reasons. Set ‘X’ here.
<CRANG>: Reserved for legacy reasons. Set ‘X’ here.
<SUBS>: Reserved for legacy reasons. Set ‘X’ here.
<HDCP>: **HDCP encryption:**
A = automatic,
1 = always use.

Legend for response:

G block: General status information

<CON>: **Connection sense:**
0 = There is no attached sink device,
1 = Sink device attached (termination is present)

<MODE>: **Output signal mode**
D = DVI,
H = HDMI 24bit,
1 = HDMI 30bit deepcolor
2 = HDMI 36bit deepcolor

<SIG>: **Signal present**
0 = No valid signal is routed to this port,
1 = Valid video signal is present.

<HDCP>: **HDCP encryption status**
0 = HDCP encryption is inactive,
1 = HDCP encryption is active.

<HPD>: **Hotplug detection**
0 = Hotplug detect signal is low,
1 = Hotplug detect signal is high.

O block: Actual output settings

<MODE>: Same as in G block.
<CSPAC>: Reserved for legacy reasons. Response is always 'A'.
<CRANG>: Reserved for legacy reasons. Response is always 'A'.
<SUBS>: Reserved for legacy reasons. Response is always 'A'.
<HDCP>: Same as in G block.

M block: Attached device (monitor) information

<HSUP>: 0 = Sink device does not support HDMI
1 = Sink device supports HDMI

<AUTH>: 0 = HDCP authentication failed
1 = HDCP authentication is successful

<REP>: 0 = Attached device is not an HDCP repeater
1 = Attached device is an HDCP repeater

<YUV4>: 0 = Attached device does not support YUV 4:4:4
1 = Attached device supports YUV 4:4:4

<YUV2>: 0 = Attached device does not support YUV 4:2:2
1 = Attached device supports YUV 4:2:2

<AUD>: 0 = Attached device has no audio capabilities
1 = Attached device has audio capabilities

<PCM>: This field represents a byte in hexadecimal format.
The binary bits show support for different audio bit rates.
bit 0 - Sink device supports 32kHz PCM audio
bit 1 - Sink device supports 44kHz PCM audio
bit 2 - Sink device supports 48kHz PCM audio
bit 3 - Sink device supports 88kHz PCM audio
bit 4 - Sink device supports 96kHz PCM audio
bit 5 - Sink device supports 176kHz PCM audio
bit 6 - Sink device supports 192kHz PCM audio
bit 7 - Reserved (Always 0 in this version of protocol)

<DC>: This field is a number is decimal format.
The binary bits show support for different color modes.
bit 2 - HDMI deep color 30bits/pixel mode is supported
bit 1 - HDMI deep color 36bits/pixel mode is supported
bit 0 - YUV444 color space is supported in DC modes

Info: *The M block can be missing if there is no attached device on output.*

7.11.2. Query output video properties

Description: Displays the status for output port.

Format		Example	
Command	{:HDMI#<out>@<S/A>O=?}	→	{:hdmi#1@so=?}
Response	(HDMI#<out>@<S/A>O= **G**<CON><MODE><SIG> <HDCP><HPD>; **O**<MODE><CSPAC> <CRANG>;<SUBS> <HDCP>) **M**<HSUP><AUTH><REP> <YUV4><YUV2> <AUD><PCM><DC>CrLf	←	(HDMI#1@SO=G0H100; OHAAA1;)CrLf

Legend: Please read section *7.11.1*. (*Set output video properties*)

7.11.3. Set output audio properties

Description: Set audio properties for a single or multiple channels.

Format		Example	
Command	{:AUDIO#<out>@<S/A>O= <RVOL>;<LVOL>; <BASS>;<TREBLE>; <PREEMP>;<INVERT>;}	→	{:audio#1@so=422;500;20;4;1;0;}
Response	(AUDIO#<out>@<S/A>O= <RVOL>;<LVOL>; <BASS>;<TREBLE>; <PREEMP>;<INVERT>;) CrLf	←	(AUDIO#1@SO=422;500;20;4;1;0;) CrLf

Legend:
<S/A>: S = single-selected output, A = all outputs
<RVOL>: reduce right volume in dB*100 (7800 = -78dB, 0 = -0dB)
<LVOL>: reduce left volume in dB*100 (7800 = -78dB, 0 = -0dB)
<BASS>: low frequency enhancement in dB (24 = 6 dB gain)
<TREBLE>: high frequency enhancement in dB (6 = 6dB gain)
<PREEM>: pre-emphasis (1 = on, 0 = off)
<INVERT>: phase invert (1 = on, 0 = off)

Explanation: The example sets a single output to:
right volume reduction: 4.22dB,
left volume reduction: 5.00dB,
bass enhancement: 20dB,
treble enhancement: 4 dB,
pre-emphasis: on
phase inverting: off.

All parameters can be replaced by ‘X’, to keep the correspondent parameter unmodified. The command {:AUDIO#1@SO=x;x;24;6;0;1;} will leave the volume settings untouched.

7.11.4. Query output audio properties

Description: Read audio properties for a single or multiple channels.

Format		Example
Command	{:AUDIO#<out>@<S/A>O?}	→ {:audio#1@so=?}
Response	(AUDIO#<out>@<S/A>O= <LVOL>;<RVOL>; <BASS>;<TREBLE>; <PREEMP>;<INVERT>;)CrLf	← (AUDIO#1@SO=422;500;20;4;1;0;) CrLf

Legend: Please read section *7.11.3*. (*Set output audio properties*)

7.12. Error responses

Invalid input number

Description: Given input number exceeds the maximum number of inputs or equals zero.

Response	(ERR01)CrLf

Invalid output number

Description: Given output number exceeds the installed number of outputs or equals zero.

Response	(ERR02)CrLf

Invalid value

Description: Given value exceeds the maximum allowed value can be sent.

Response	(ERR03)CrLf

Invalid preset number

Description: Given preset number exceeds the maximum allowed preset number.

Response	(ERR04)CrLf

8. Firmware upgrade

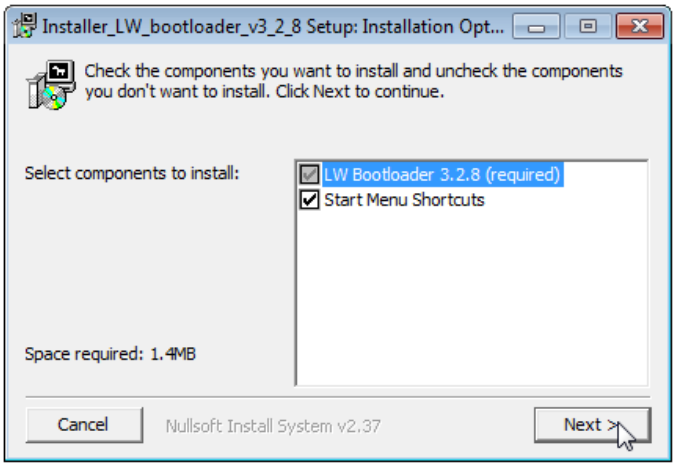
This chapter is meant to help customers perform firmware upgrades on our products by giving a few tips on how to start and by explaining the features of the Bootloader software.

8.1. Installing the Bootloader

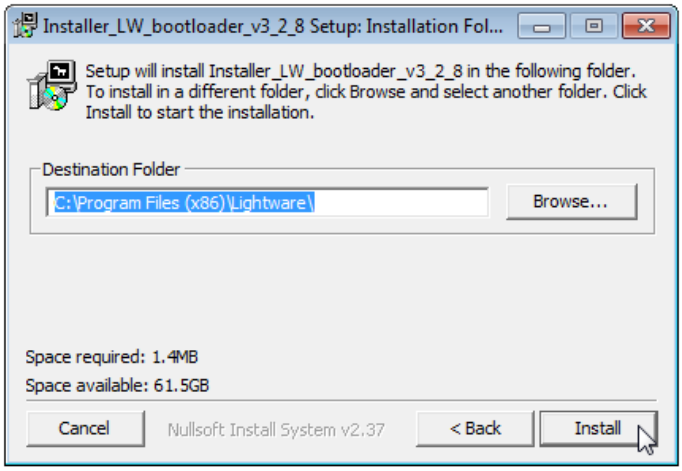
UMX4x4-Pro can be upgraded using Lightware Bootloader from a Windows based PC or Laptop via Ethernet.

8.1.1. Installing and launching the Bootloader software

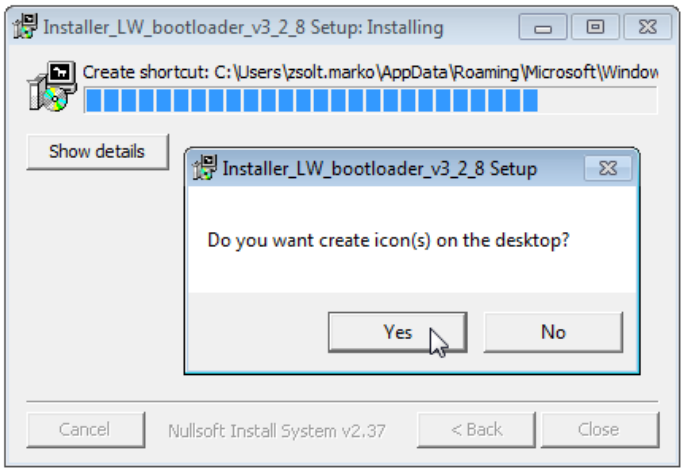
Step 1. Run Installer_LW_bootloader_v3_2_8.exe (3_2_8 means the 3-digit firmware version of the Bootloader)


Installer_LW_bootloader_v3_2_8 Setup: Installation Opt...
Check the components you want to install and uncheck the components you don't want to install. Click Next to continue.
Select components to install:
LW Bootloader 3.2.8 (required)
Start Menu Shortcuts
Space required: 1.4MB
Cancel
Nullsoft Install System v2.37
Next >

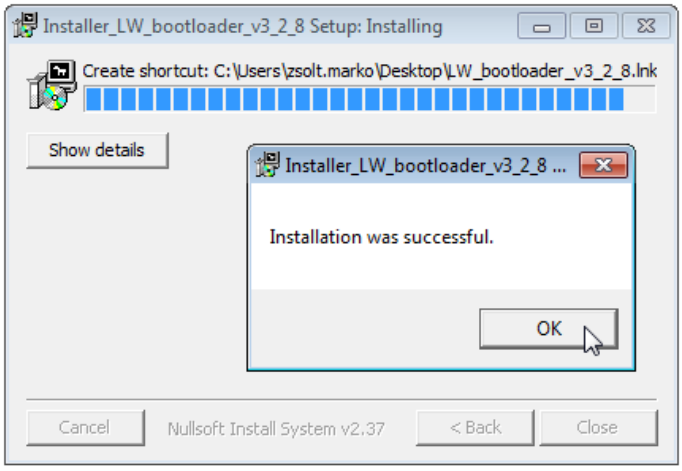
Step 2. Select destination folder and select Install (Using the default path is highly recommended)


Installer_LW_bootloader_v3_2_8 Setup: Installation Fol...
Setup will install Installer_LW_bootloader_v3_2_8 in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.
Destination Folder
C:\Program Files (x86)\Lightware\
Browse...
Space required: 1.4MB
Space available: 61.5GB
Cancel
Nullsoft Install System v2.37
< Back
Install

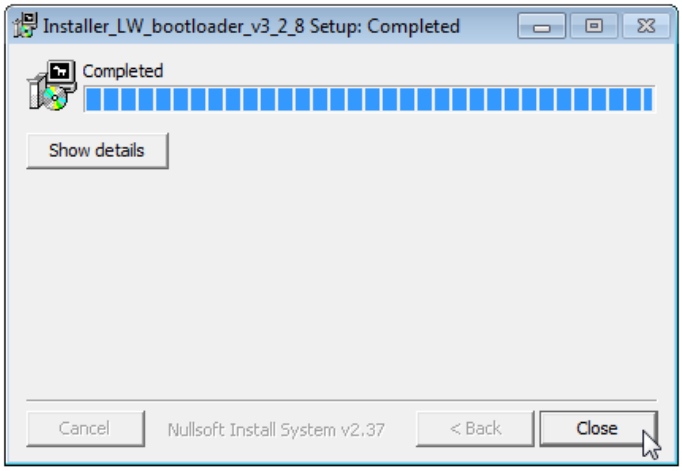
Step 3. If you want to create desktop icon select Yes in the next pop-up window:



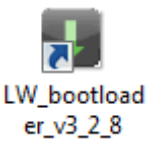
Step 4. After the files have been copied, the following message appears:



Step 5. To finish the installation process, click on the Close button.



Step 6. To run Lightware Bootloader, find the shortcut icon in Start menu → Programs → Lightware → LW_bootloader_v3_2_8 or on the desktop, and double click on it:



Uninstalling

To uninstall the Bootloader software, double click on: Start menu → Programs → Lightware → Uninstall_LW_bootloader_v3_2_8.exe

8.2. Upgrade process

8.2.1. Tips for the upgrade process

Cross UTP connection

To avoid packet loss caused by an overloaded network, it is recommended to use cross UTP connection directly from the upgrading PC to the Lightware device.

Disable other Ethernet devices

The Bootloader software always queries the PC's primary Ethernet adapter (which is usually the adapter that is connected to the Internet) for available Lightware devices. It is recommended to disable every other Ethernet device (secondary LAN, Wi-Fi, 3G modem) for the time of the upgrade. If the Bootloader cannot find the Lightware device because the device is connected to the secondary Ethernet adapter (cross UTP connection), you need to disable the primary adapter (Internet). This way the Ethernet adapter which is connected to the Lightware device will become the primary adapter and the Bootloader can query it for Lightware devices. If you disable an Ethernet adapter while the Bootloader is running, you need to restart the Bootloader to be able to query the Ethernet adapter again.

A second option in this case is that if you know the IP address and port number of the Lightware device, you may use the Add IP button.

Remove I/O connections

It is recommended to remove all video input and output connections from the Lightware device. Video sources and display devices may try to communicate with the Lightware device or send noise through the cable which may interfere with the upgrade process.

Latest Bootloader

Always perform the firmware upgrade with the latest Bootloader software. To get the latest Bootloader software, contact your local sales representatives or Lightware's support team at *support@lightware.eu*

Finishing the process with older versions of the Bootloader

Bootloader versions that are older than v3.1.8 do not close the connection with the Lightware device automatically upon finishing the upgrade process. With these versions, if you remove the UTP cable or restart the Lightware device before you properly exit the Bootloader, the Lightware device will stay in a so called 'bootload mode' and will not return to normal operating mode. In such cases connect to the Lightware device with the Bootloader again and exit from it properly.

Restart the device

After a successful firmware upgrade, the device will restart itself but it is recommended to power down and up the device after finishing the upgrade.

8.2.2. Firmware upgrade

Step 1. Connect the Lightware device and the computer via Ethernet (hub, switch, router) or Ethernet directly (with cross UTP cable).

If you are connecting via **hub, switch or router**, then you can either set the Lightware device to have a fix IP (in which case make sure that there is no IP conflict on the network) or you can set the Lightware device to DHCP mode (in which case the Lightware device will acquire an IP address automatically). In this case the network must have a DHCP server. These settings can be done from the front panel LCD menu or via the supplied Lightware Matrix Controller software. If you are connecting directly, via a

cross UTP cable, you need to set up a fix IP and subnet mask on the Lightware device and the PC.

Step 2. Start the application

To run the Bootloader software, double click on the icon of the software on the desktop or select proper shortcut from Start Menu → Programs → Lightware folder.

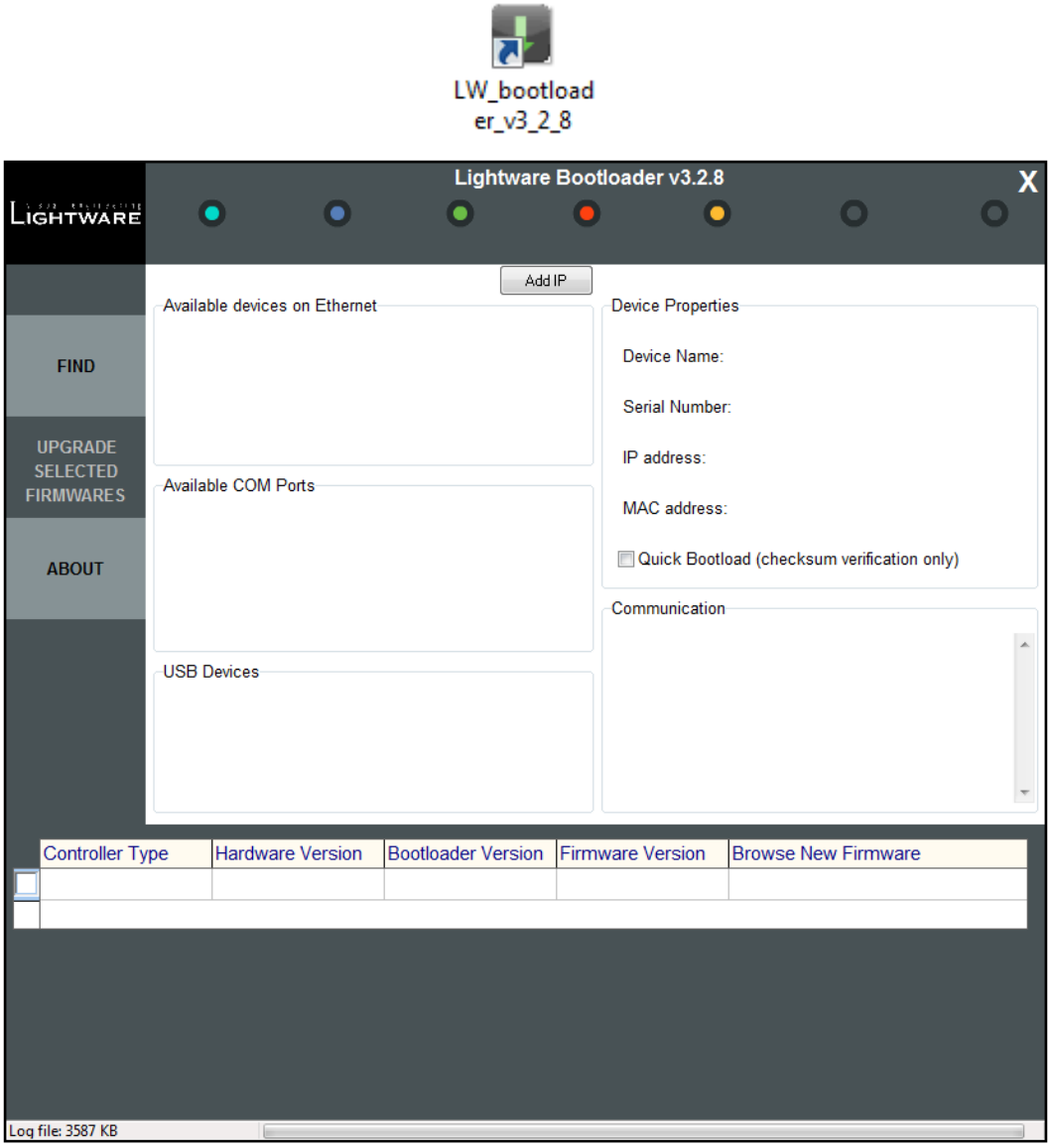


Figure 8-1. Bootloader software startup

Step 3. Find devices

Make sure that no active connection is made to the device (Lightware Matrix Controller software or web browser connected to the built-in website). Then click on the **FIND** button to query the Ethernet for Lightware devices.

Info: *COM ports do not list any information about the connected devices, users must know which COM port is connected to the Lightware device.*

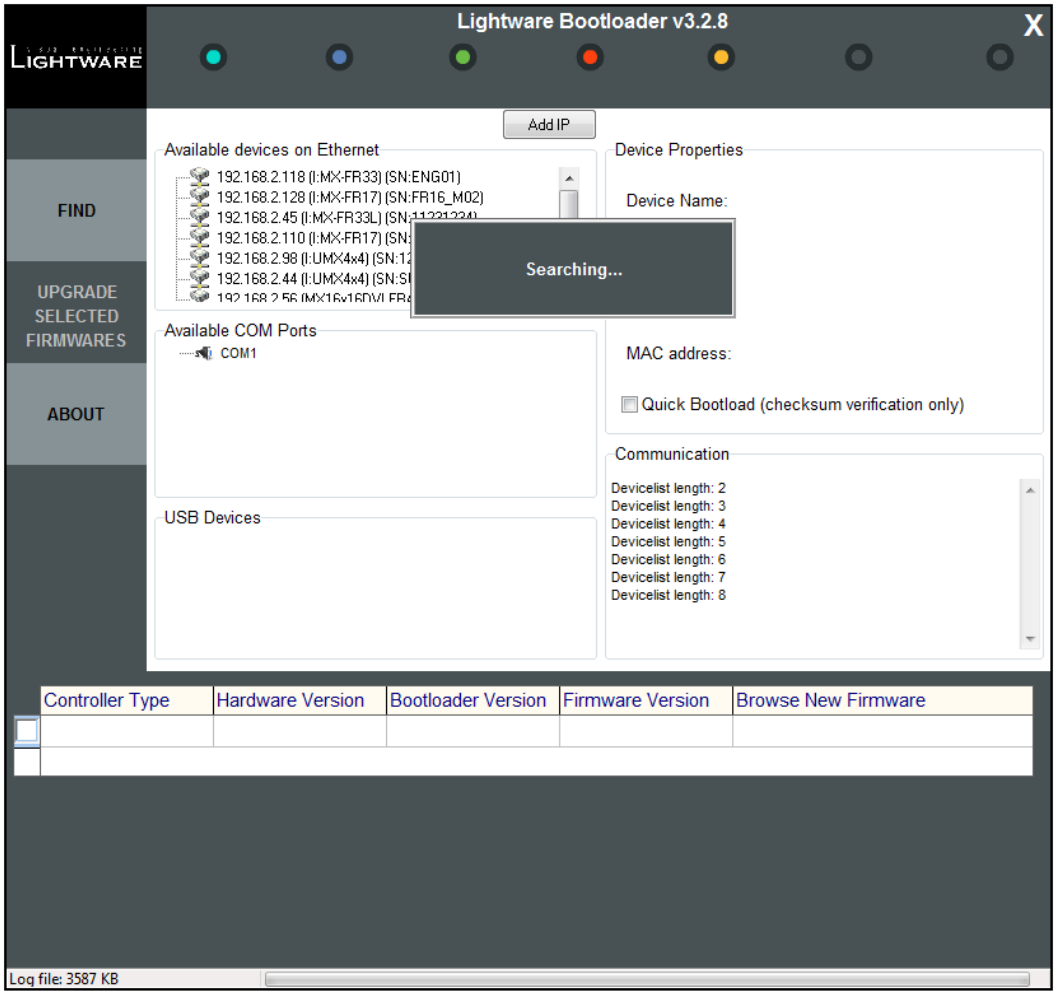


Figure 8-2. Searching for devices

The Bootloader software always queries the PC's primary Ethernet adapter (which is usually the adapter that is connected to the Internet) for available Lightware devices. It is recommended to disable every other Ethernet device (secondary LAN, Wi-Fi, 3G modem) for the time of the upgrade. If the Bootloader cannot find the Lightware device because the device is connected to the secondary Ethernet adapter (cross UTP connection), you need to disable the primary adapter (Internet). This way the Ethernet adapter which is connected to the Lightware device will become the primary adapter and the Bootloader can query it for Lightware devices. If you disable an Ethernet adapter while the Bootloader is running, you need to restart the Bootloader to be able to query the Ethernet adapter again.

A second option in this case is that if you know the IP address and port number of the Lightware device, you may use the Add IP button above the Available Devices on Ethernet window.

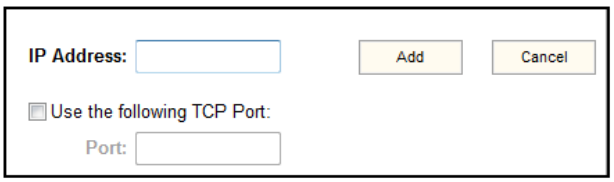


Figure 8-3. Add IP

If the Lightware device is connected to the secondary Ethernet adapter (or for any other reason) and the Bootloader doesn't list it in the available devices window, you can manually add its IP address and TCP Port number. This way the device name and IP

address won't be displayed, but double clicking on the IP address will establish the connection.

Step 4. Connect to a device

If the Bootloader finds one or more Lightware devices then they will be listed in the tree view window. This window shows the device type, IP address and serial number of the found Lightware devices. COM ports do not query these information, users must know which COM port is connected to the Lightware device. Double click on one of the available devices. The Bootloader will ask if you really want to connect to the device. Select **YES** to establish the connection. It will take 10-15 seconds to get all the information from the Lightware device. After establishing the connection the device enters bootload mode and suspends normal operation.

Warning *The bootloader application will hold the router in reset state when it establishes the connection. All connected DVI sources and monitors will act as if the router was powered down.*

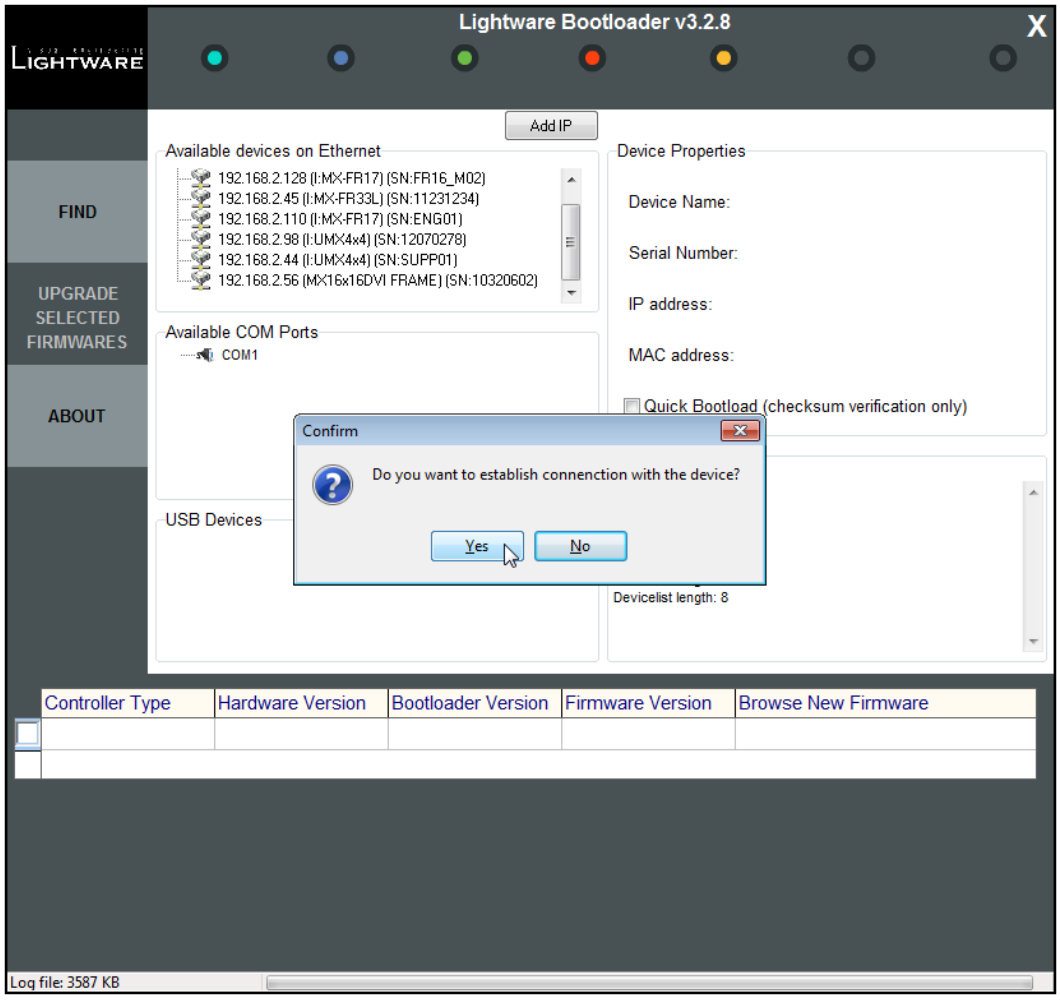


Figure 8-4. Establishing connection

Step 5. Requesting device information

After clicking on the YES button, the device name, serial number, IP address, MAC Address and current firmware versions are displayed.

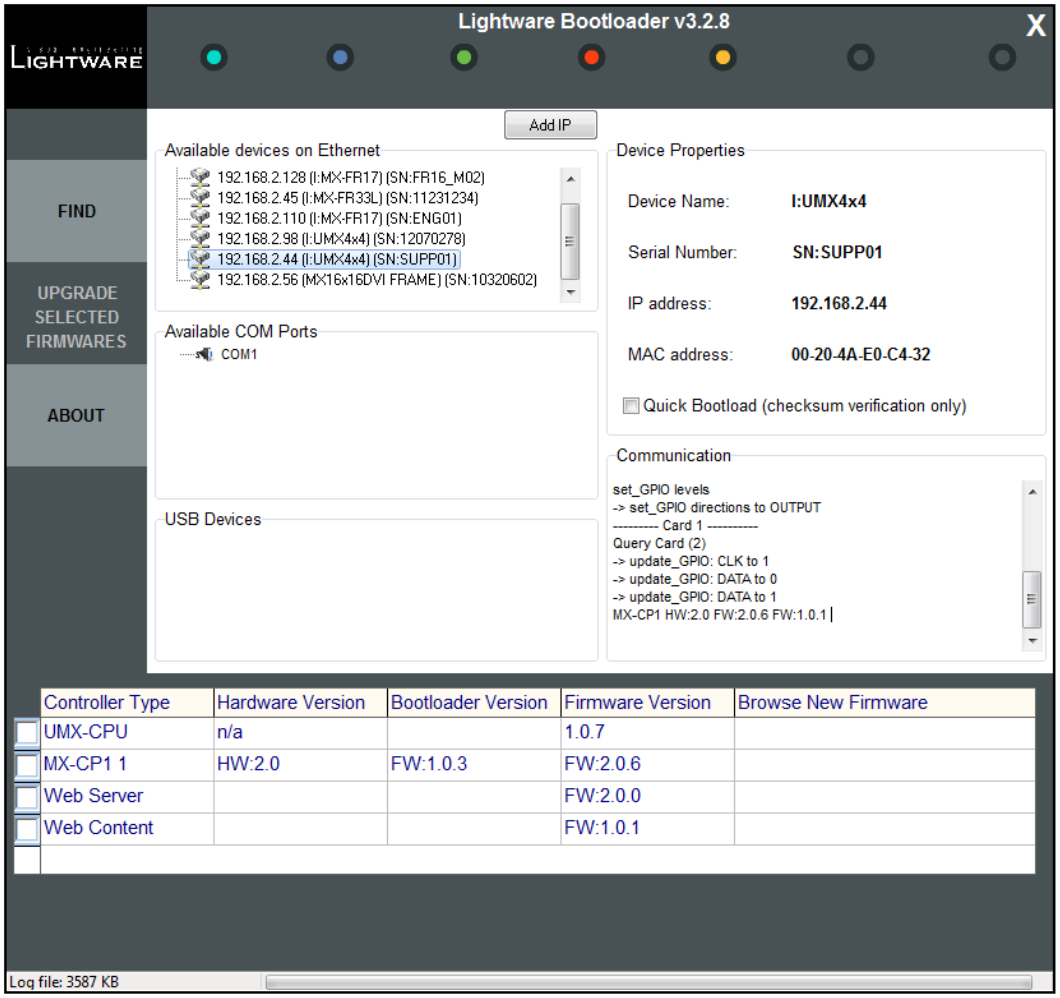


Figure 8-5. Details of the device

Step 6. Select firmwares to upgrade

To upgrade a firmware, click in the field in the line of the controller (marked with pink in the picture below). Click on **YES** in the pop-up window to modify the path to the new firmware file. Controller types are described in the table below. Now you can browse for the new firmware file to upload. After opening the new file, the new firmware field will contain the name of the firmware file.

Controller name	Description
UMX-CPU	The main processor in the matrix.
MX-CP1 1	Front side control panel for the matrix.
Web Server	The controller that handles Ethernet communication in devices with Ethernet port.
Web Content	The controller that handles the built-in website in devices with Ethernet port.

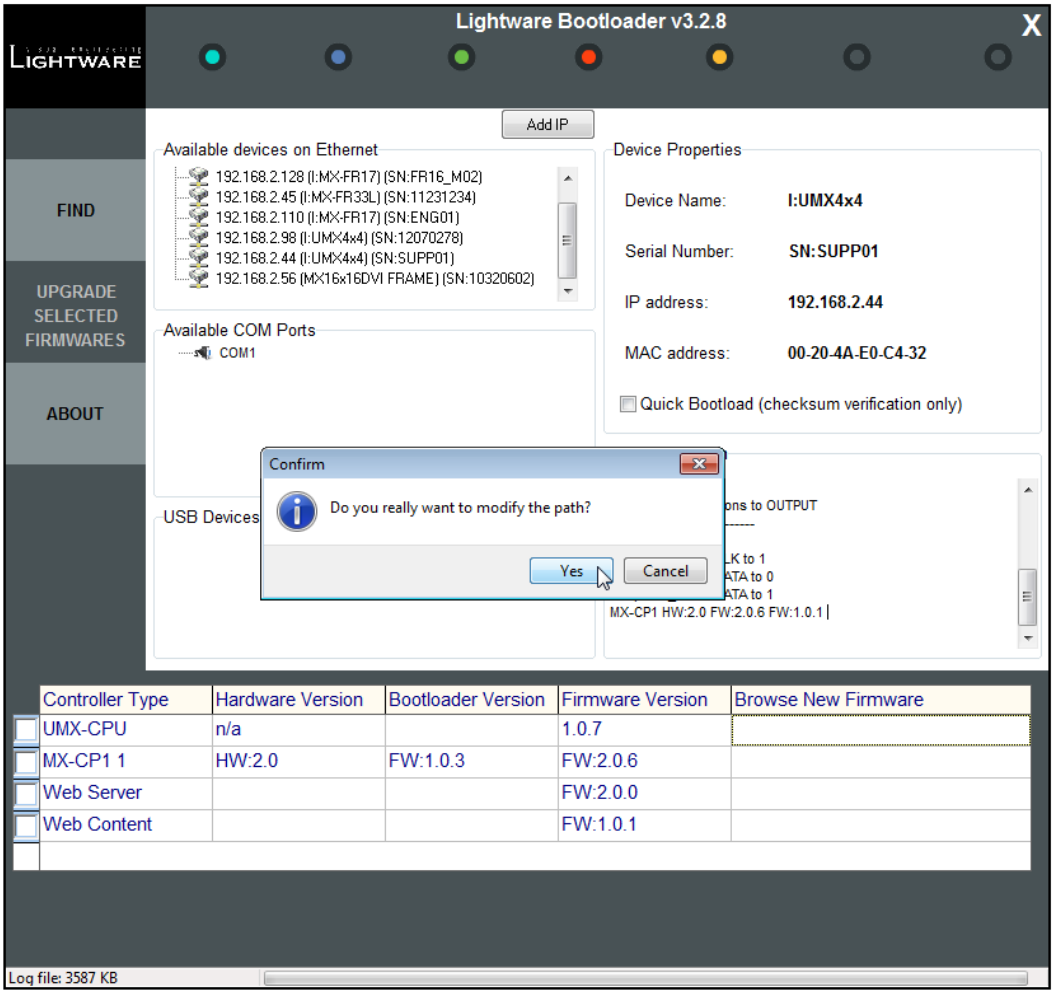


Figure 8-6. Selecting new firmware files

Step 7. Enable the upgrade and Quick Bootload mode

After selecting the new firmware file, you must enable the upgrade by clicking the checkbox left to the controller type (marked with a red circle in the picture below). You may enable Quick Bootload mode by clicking the checkbox next to it (marked with a red rectangle in the picture below). Quick Bootload mode speeds up the process by not reading back the written data, only verifying the checksum. It can be enabled and disabled any time during the upgrade process.

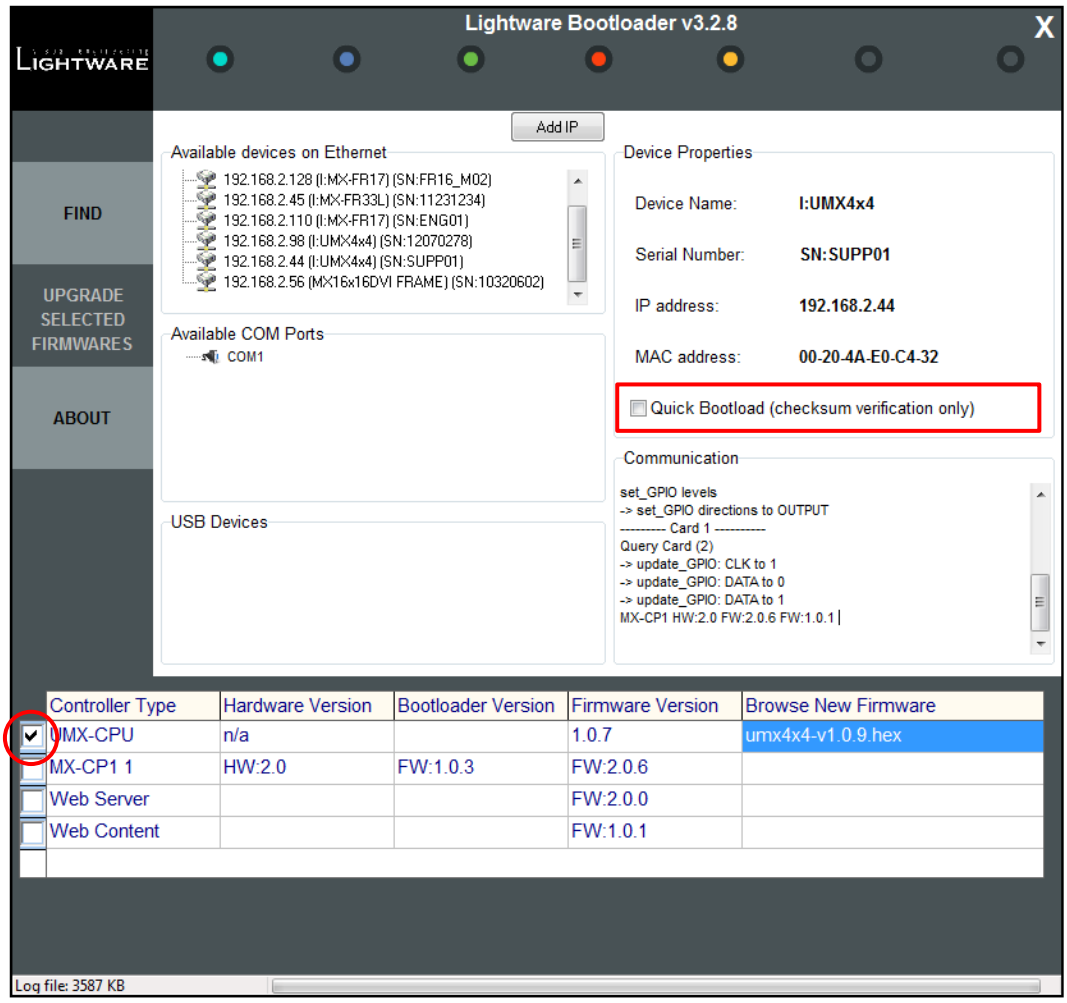


Figure 8-7. Enabling the upgrade and Quick Bootload mode

Step 8. Starting the upgrade process

After selecting all the firmwares that need to be upgraded, click on the **UPGRADE SELECTED FIRMWARES** button. Then click on **YES** in the appearing window to start the process.

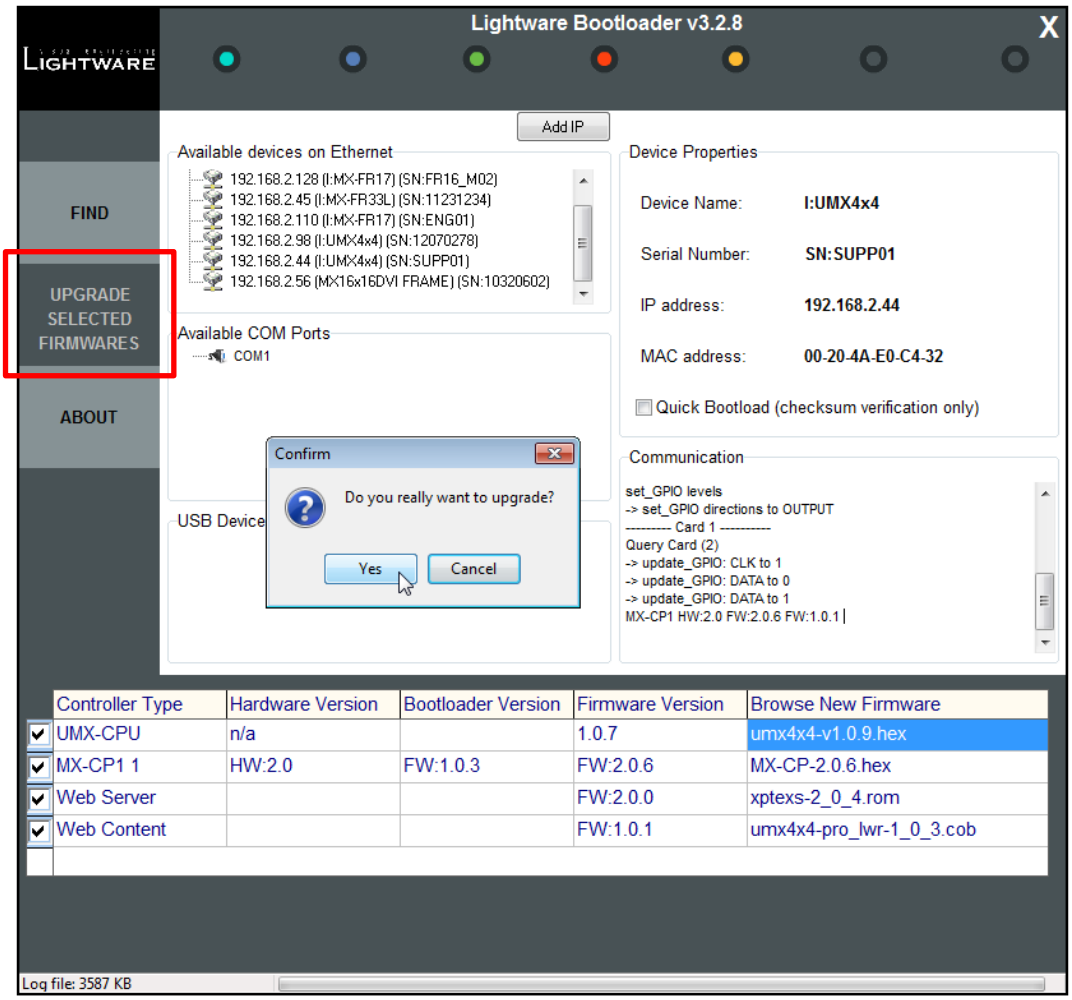


Figure 8-8. Starting the upgrade process

Step 9. Upgrading

The Bootloader will first erase the content of the controllers and then write the new firmware data. This process can be monitored in the communication window and the progress bar (both are marked with red rectangles in the picture below).

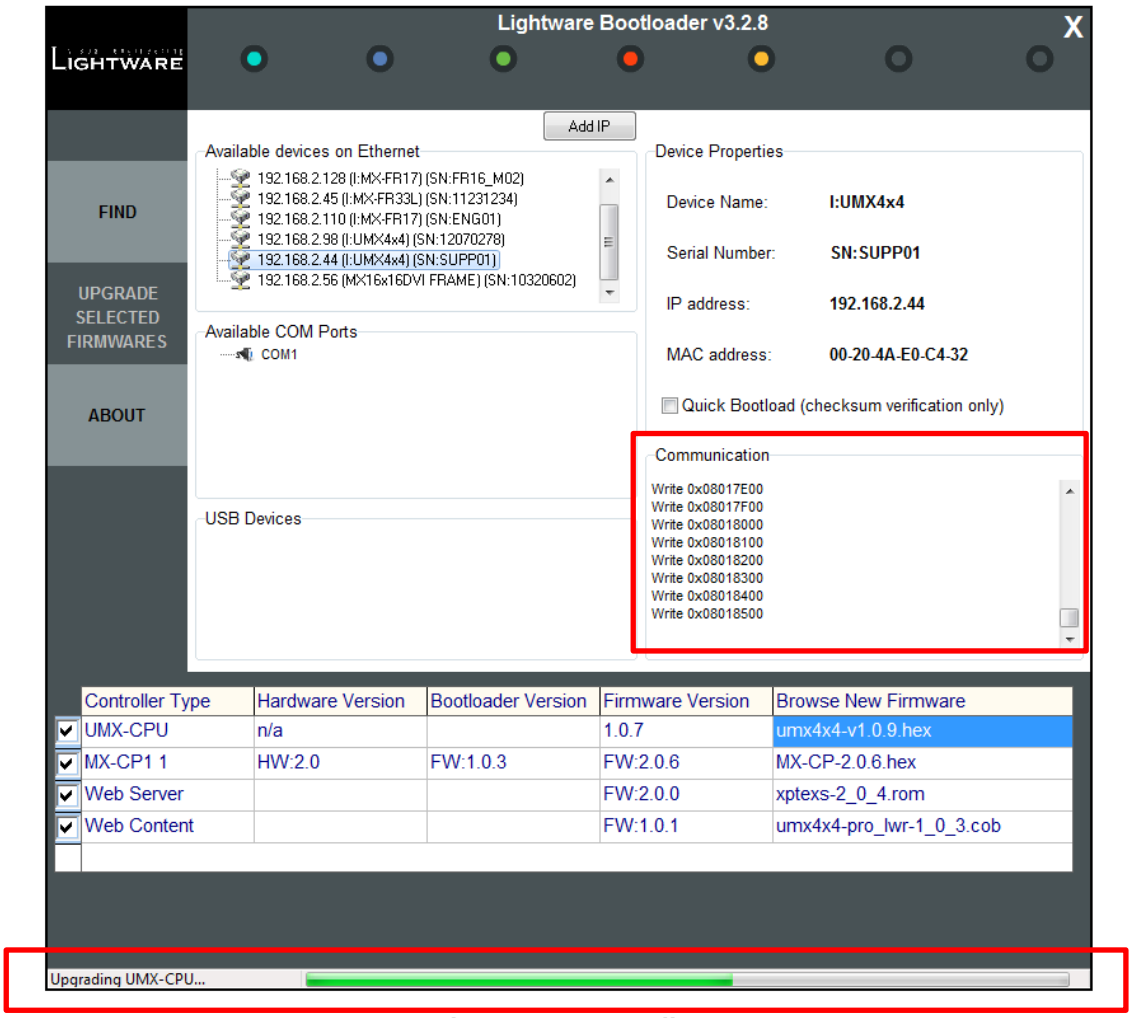


Figure 8-9. Upgrading

Step 10. Closing connections

After all controllers are upgraded, the Bootloader will close the connection with the Lightware device, which will reboot itself and return to its normal operating mode.

Warning *Bootloader versions that are older than v3.1.8 will not close the connection and restore the Lightware device until you exit the Bootloader.*

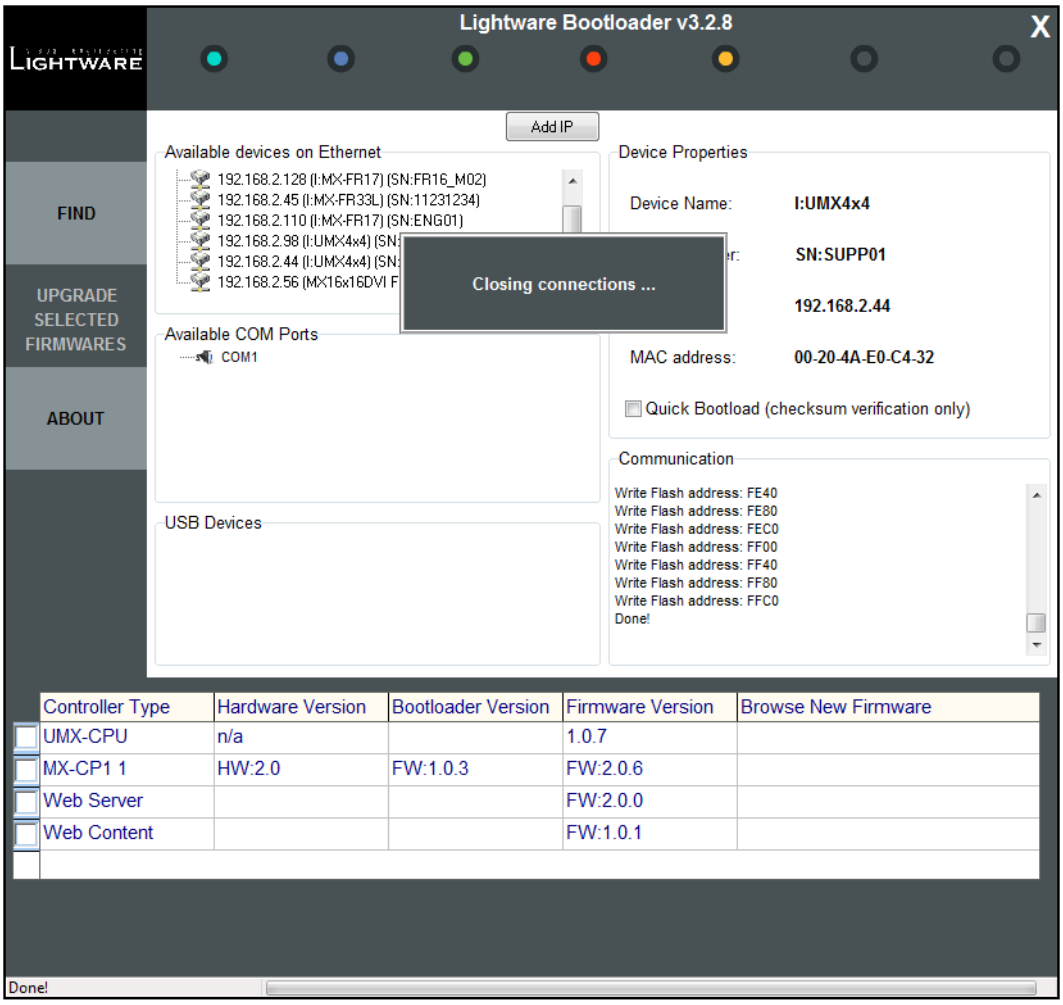


Figure 8-10. Closing connections

Step 11. Upgrade successful

If the connections are closed and no errors occurred, the firmware upgrade is SUCCESSFUL. Click on the **OK** button and then you may exit the Bootloader or connect to another Lightware device to perform firmware upgrades.

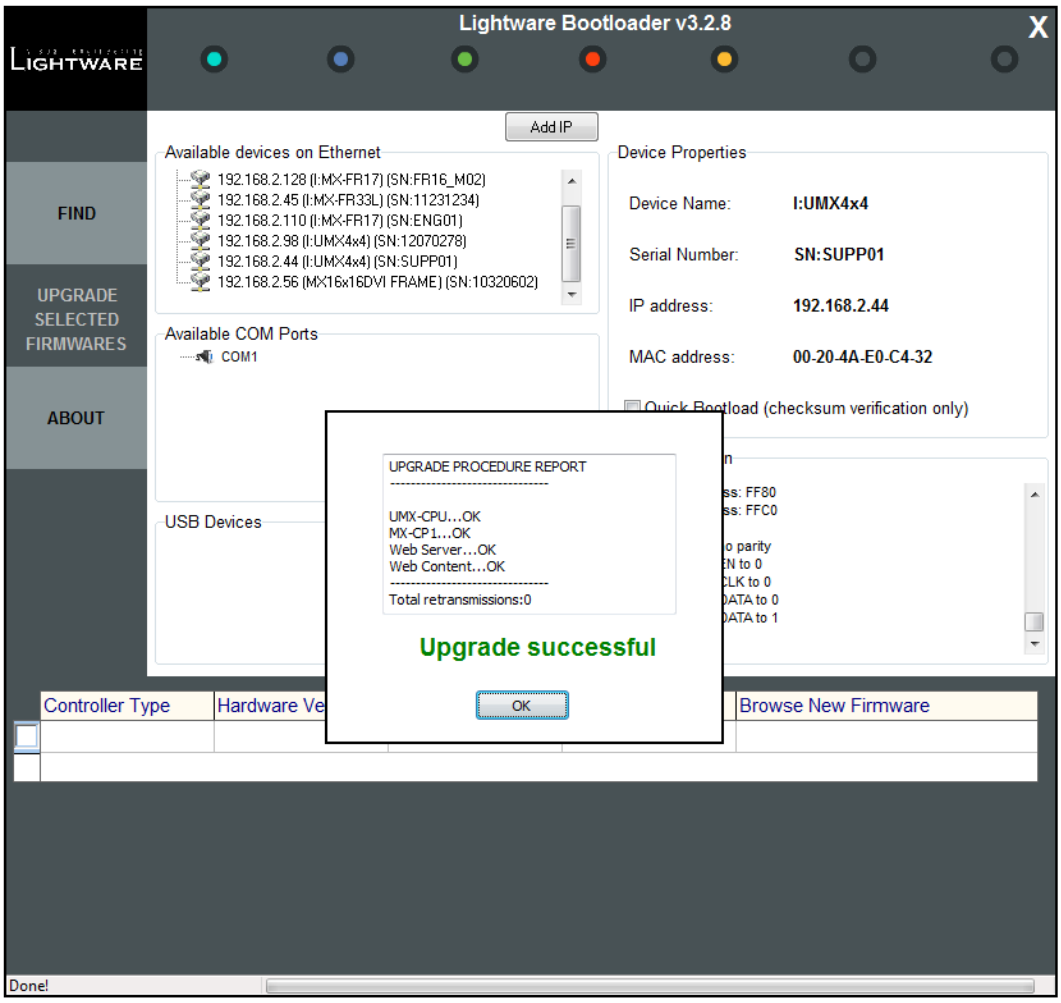


Figure 8-11. Upgrade successful

Step 12. Restart the device

The Lightware device will restart itself automatically, but it is recommended to completely power down and power up the device after exiting the Bootloader.

9. Troubleshooting

9.1. General problems

Check the router

Check whether the router is properly powered and whether CPU LIVE LED is blinking. Try performing a reset through the controller software, or unplug and reconnect the router's power cable.

Important! *Check whether the RESET button is released properly! If the plastic cap gets stuck under the back of the enclosure the matrix can not work.*

9.2. Serial connection problems

Check the protocol

Check whether the proper protocol is selected. Select Protocol #1 in order to use the matrix with the controller software.

Check the cable and software settings

Check whether your male to female straight serial cable is properly connected. In most cases there are more COM ports present in the operating system. Please verify the connection settings of your software. The router communicates by default with **9600** Baud, **8** data bit, **N**o parity, **1** stop bit.

9.3. TCP/IP connection problems

Check the LAN cable type

If you connect the router directly to your computer, you must use a cross-link cable. If the matrix is connected to an Ethernet hub, switch or router, you have to use a straight patch LAN cable.

Check the network connection

The computer and the router have to be in the same network. If your computer has multiple network connections (for example WiFi and LAN connections are used simultaneously), check which network the router is connected to. The appropriate Ethernet interface has to be selected in the Find dialog box of the Matrix Controller software.

Check the IP settings

If you connect the router directly to your computer, you have to set the router's IP address manually, since in this case there is no DHCP server that could assign an address to the matrix.

If the IP address is set manually, check if there is an IP address conflict. If there is a DHCP server on the network, try to set the matrix to DHCP mode.

Check whether your computer's firewall blocks the selected port.

Check the proxy settings

If the connection between the matrix and the computer cannot be created and a proxy server is used in your network please turn off the proxy or add the local network addresses to the proxy exceptions.

Check the live connections

Only one connection is allowed simultaneously. Check whether there is another open connection (e.g. opened router web interface, running control software over Ethernet). Try restarting the router if you have no other option.

9.4. Picture is not displayed or distorted

Check the cables (DVI)

Due to the high data rates, the cables must fit very well. DVI connectors have to be locked with screws, no tensions or breaches are allowed. If your source or display has more connectors then make sure that the proper input port is selected.

Check the cables (TP)

Due to the high data rates, high quality cables must be used. It is recommended to use Cat6 or Cat7 S/FTP cables.

Check the crosspoint matrix

Check the connection between the input and output port either on the front panel or from web or the control software. Check whether the output is muted or not.

Check EDID related problems

Maybe your display device is not capable of receiving the sent video format. Try emulating your display device's EDID to the source.

Check the source

Check whether your source is powered on and configured properly. The HDMI output can be turned off on most DVD players. If the source is a computer, then verify that the DVI output is selected and active. Try restarting your computer; if you get a picture during the booting process, you have to review the driver settings.

9.5. Bootload

The Bootloader cannot find the matrix

The Bootloader software always queries the PC's primary Ethernet adapter (which is usually the adapter that is connected to the Internet) for available Lightware devices. It is recommended to disable every other Ethernet device (secondary LAN, Wi-Fi, 3G modem) for the time of the upgrade. If the Bootloader cannot find the Lightware device because the device is connected to the secondary Ethernet adapter (cross UTP connection), you need to disable the primary adapter (Internet). This way the Ethernet adapter which is connected to the Lightware device will become the primary adapter and the Bootloader can query it for Lightware devices. If you disable an Ethernet adapter while the Bootloader is running, you need to restart the Bootloader to be able to query the Ethernet adapter again.

A second option in this case is that if you know the IP address and port number of the Lightware device, you may use the Add IP button above the Available Devices on Ethernet window.

Upgrade FAILED

If the connection is unreliable and the Bootloader cannot communicate with the Lightware device, then the **"Upgrade failed!"** warning messages appears.

The Bootloader retries the transmission 3 times. If it doesn't succeed, then the upgrade procedure will have FAILED. In this case exit the Bootloader, try to establish a reliable connection with the Lightware device and repeat the upgrade process. It may happen that

when you try to find the device again, the Available devices window will only show the IP address of the Lightware device but not the device type and serial number. The reason for this is that the Lightware device may still be in bootload mode and the controllers cannot send any information about themselves. You can still double-click on the IP address and the Bootloader will establish the connection.

No controller selected to upgrade!

If you didn't check any checkboxes left to the controller types then the **"No controller selected to upgrade!"** message appears. Click at least one of the checkboxes before you click on the UPGRADE SELECTED FIRMWARES button.

The controller was not upgraded

Make sure that the checkbox next to the controller type is checked before you click on the **UPGRADE SELECTED FIRMWARES** button. These checkboxes enable the firmware upgrade on the different controller types.

An invalid file has been selected

The Bootloader checks if valid firmware files have been selected for the controllers. If an invalid file (not firmware file) has been selected, then the **"WARNING! Upgrade failed: Invalid checksum"** warning messages appears.

Please select a valid firmware file.

Firmware selected for the wrong controller

If an otherwise valid firmware file has been selected but for the wrong controller, the **"WARNING! Invalid controller type info for UMX4x4_pro"** warning message appears.

Please select the appropriate firmware file for the controller.

Corrupt firmware file

If the correct firmware file is selected for the controller but it somehow became corrupted (the checksum is incorrect), then the **"WARNING! Upgrade failed: Invalid checksum. Invalid controller type info for UMX4x4-Pro. Invalid hardware info for UMX4x4-Pro."** warning messages appear.

Please contact your local sales representative or Lightware's support team at *support@lightware.eu* and ask for the correct firmware files.

10. Specifications

General

Compliance ..... CE, UL, FCC

EMI/EMC ..... EN 55103-1, EN 55103-2

Safety ..... EN 60065 Class I

Warranty ..... 3 years

Cooling ..... Convention only

Operating temperature ..... -20°C ~ +50°C (-4°F to +122°F)

Operating humidity ..... 10 ~ 90% RH, noncondensing

Power

Power source ..... 100-240 V AC; 50~60 Hz; (max. 0.4 - 0.2 A)

Power adaptor ..... Internal

Power supply unit type NLP70

Power consumption ..... max 40 W (137 BTU/hour)

AC power connector ..... IEC C14 receptacle

Enclosure

Rack mountable ..... Yes, 1U high

Material ..... 1 mm steel

Dimensions in mm .....446 (482*)W x 302D x 44H

Dimensions in inch .....17.6 (19.0*)W x 11.9D x 1.7H

Net Weight ..... 5000 g

* with rack mounting ears

Control

Front Panel buttons ..... Yes, 23 buttons

Serial port connector ..... DE-9F (9 pole D-SUB female for RS-232)

Baud rate ..... 9600 Baud, 8 bit, 1stop bit, no parity

Ethernet port connector ..... RJ45 female connector

Ethernet protocol ..... TCP/IP, HTTP, TFTP, Telnet

IP address assignment ..... fixed, DHCP, BOOTP, and AutoIP

Video inputs

DVI connector ..... 29-pole, DVI-I digital and analog
Input cable equalization ..... Yes, digital only, max 20 m
EDID emulation ..... Yes, analog and digital

Video outputs

DVI connector ..... 29 pole, DVI-I digital only
EDID read ..... Yes, analog and digital
+5V output current ..... 500 mA continuous on each port

Analog audio ports

Number 4
Signal type ..... analog stereo, unbalanced
Connector type ..... RCA (for left and right channel)

S/PDIF audio ports

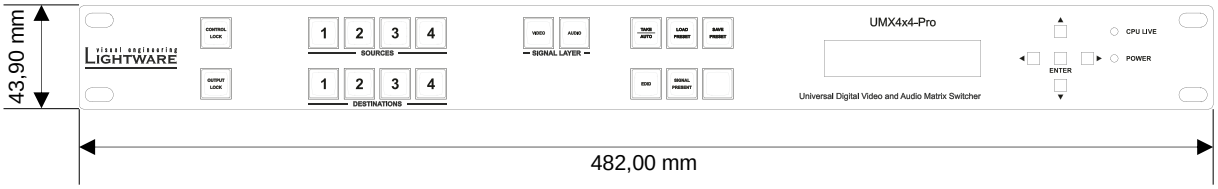
Number 4
Connector type ..... RCA

Digital video signal

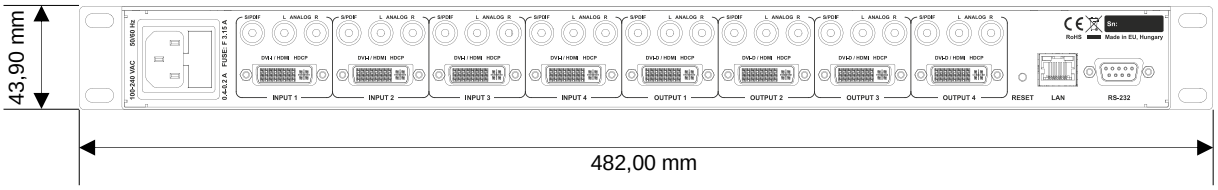
Signal standard ..... DVI or HDMI standard which supports:
..... Deep color, Embedded audio
Color depth ..... maximum 36 bits, 12 bit/color
Color format ..... RGB, YCbCr 4:4:4, xvYCC digital video
Color space conversion ..... Yes, always from any to RGB
Maximum data rates ..... 6.75 Gbps (2.25 Gbps /TMDS channel)
Maximum pixel clock ..... 225 MHz
Video delay ..... 0 frame
Resolutions ..... all between 640x480 and 2048x1080@60 Hz deep color
HDTV resolutions 720p, 1080i, 1080p
Reclocking ..... Pixel Accurate Reclocking
EDID Support ..... Advanced EDID management (analog and digital)
EDID Emulation ..... Yes, 100 factory preset, 50 user programmable
Output mode ..... Automatic (DVI or HDMI)
HDCP compliant ..... Yes

10.1. Mechanical Drawings

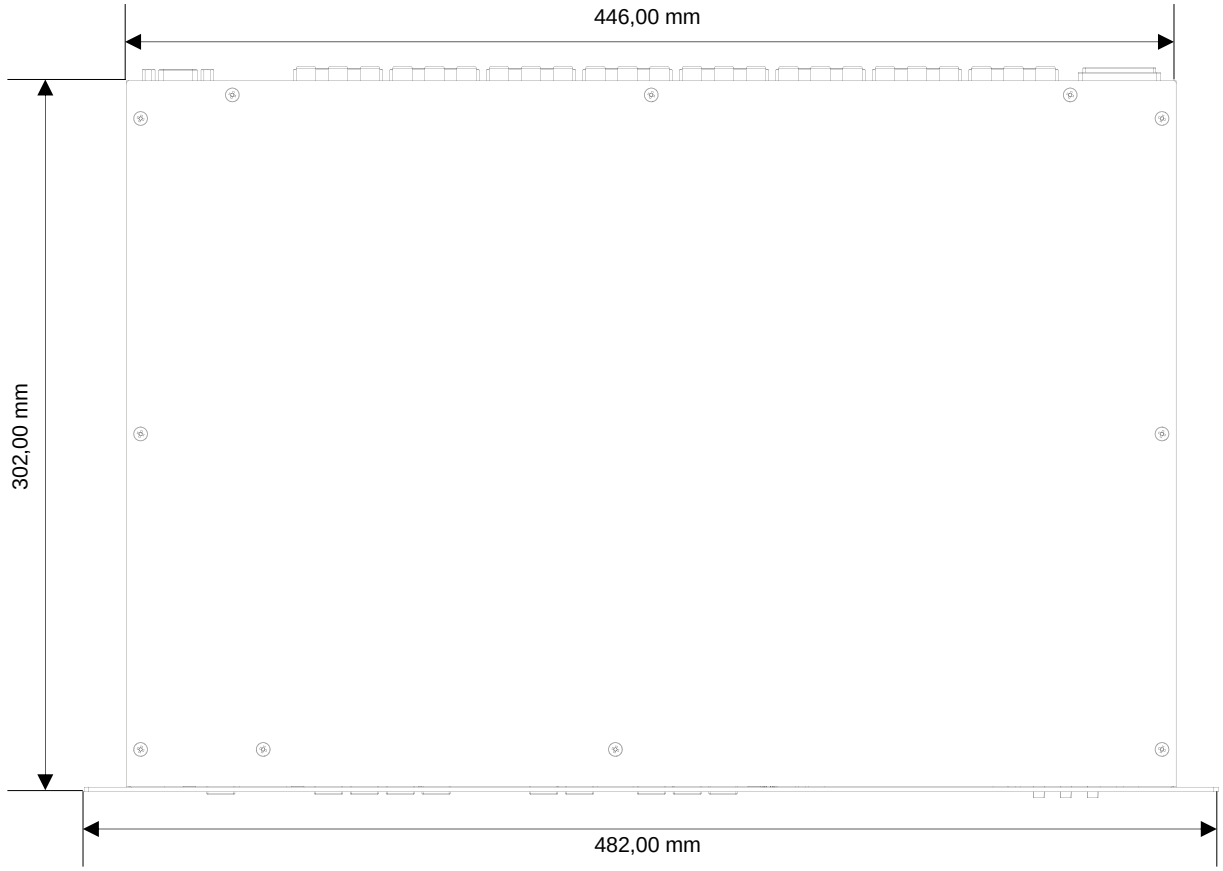
Front View



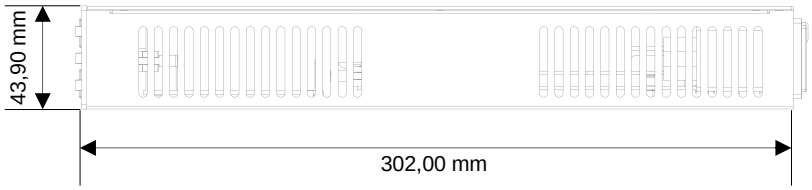
Rear View



Top View



Right View



11. Version applicability

This User's Manual applies to the following versions of the mentioned software, firmware and hardware:

	version
Lightware Matrix Controller software	3.4.2
Lightware Bootloader software	3.2.8
router CPU firmware (UMX-CPU)	1.2.1
router Motherboard	PCB 1.2
router Control Panel firmware (MX-CP1 1)	2.0.6
router Control Panel hardware	PCB 2.0
CPU board / Web Server	2.0.4
CPU board / Web Content	1.0.3
router enclosure	413-101-121

12. Warranty

Lightware Visual Engineering warrants this product against defects in materials and workmanship for a period of three years from the date of purchase.

The customer shall pay shipping charges when unit is returned for repair. Lightware will cover shipping charges for return shipments to customers.

In case of defect please call your local representative, or Lightware at

Lightware Visual Engineering

15 Peterdy Street, Budapest H-1071, HUNGARY

Tel.: +36 1 889 6177

Fax.: +36 1 342 9903

E-mail: *support@lightware.eu*

13. Document revision history

Document	Release Date	Changes	Editor
Rev. 1.0	19-10-2012	Initial version	Zsolt Markó
Rev. 1.1	16-07-2013	Minor corrections	Zsolt Markó